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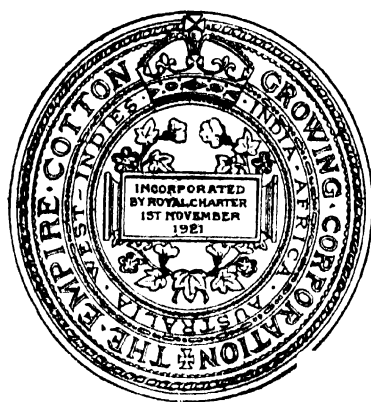
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THE EMPIRE COTTON GROWING REVIEW

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No. 1

In the opening phase of the Kaiser's War the popular slogan in this country was "Business as usual," a phrase which later, for reasons not very obvious now, earned serious disapproval. When the clouds of the Führer's War began to rise over the horizon there was in contrast a general expectation, inspired by the highest authority, that this time there could be no business as usual, if indeed there were any business at all other than making or enduring "total war."

Acting on this belief the Empire Cotton Growing Corporation announced that the issue of this Review would be suspended for the duration of the war. In addition to the immediate difficulties of production which were anticipated there seemed to be two sound reasons for this decision: one, that potential contributors would be otherwise occupied, and the other, that the flow of literature on subjects connected with cotton growing would seriously diminish.

In its main aspects the war in its first phase turned out to be static rather than dynamic. We have gradually come to realize that up to the present business in many directions could very well have been carried on as usual, and that although this possibility may end any day it may equally, so far as anyone in this country knows, continue indefinitely.

In the circumstances there seems no reason why this journal should not resume that part of its functions of which the continued suspension would cause most present sense of loss and future difficulty. The stream of information has not dried up, it has persisted unabated, and we have evidence of the demand which exists to be kept in touch with it, a demand all the more urgent because of the interruption

or slowing down of world communications. The decision has therefore been taken to issue this Abstract Number in order to maintain the continuity of a feature which we are assured is widely useful, and, if circumstances still permit, to continue this service by the issue of similar numbers at approximately six-monthly intervals.

ABSTRACTS OF CURRENT LITERATURE

COTTON IN INDIA.

1. IMPRESSIONS OF COTTON GROWING IN INDIA BY A VISITOR FROM EGYPT AND THE SUDAN. By F. Crowther. (*Agr. and Livestock in India*, ix., **4**, 1939, p. 401.) The author has much experience of the problems of cotton cultivation both in Egypt and the Sudan, and his impressions of cotton growing in India, after touring that country, are given under the following headings: Average Yields, Selection of New Varieties, Cultivation in North India, Cultivation of Black Cotton Soils, Manuring, Method of Application of Nitrogenous Fertilizers, Field Experiments.

2. THE PROGRESS OF AGRICULTURAL SCIENCE IN INDIA DURING THE PAST TWENTY-FIVE YEARS. By W. Burns. (*Misc. Bull. No. 26*, Imp. Coun. Agr. Res. Delhi, 1939. From *Pl. Bre. Absts.*, ix., **3**, 1939, p. 263.) The survey covers, among other topics, breeding work on cotton, wheat, rice, millets, oilseeds, sugar-cane and other crops.

3. COTTON GROWING: TREND OF DEVELOPMENT. By C. V. Mehta. (*Times Eng. Suppl.*, **44**, 1939, p. xliii. From *Pl. Bre. Absts.*, x., **1**, 1940, p. 8.) Improvements in the cotton-growing industry in India during the last 15 years are reviewed, with particular reference to the significance of plant-breeding work in producing varieties of enhanced yield and staple length. Average yield per acre is shown to have increased by 14 per cent. when the period 1923-28 is compared with 1933-38, an increase due to improvements in both cultivation and variety. The task of still further increasing the area under staple cotton capable of spinning at least 20's standard warp count is regarded as one of the chief objectives of cotton breeding in India.

4. INDIAN COTTON: REVIEW OF THE 1938-39 SEASON. We have received from Messrs. Chunilal, Mehta and Co., Bombay, a copy of the *Indian Cotton Review for the 1938-39 Season*. The area under cotton totalled 23,553,000 acres as against 25,746,000 acres for the previous season; the decline in acreage was due to the low prices ruling and to the unfavourable weather conditions at the time of sowing. Production was estimated at 5,120,000 bales of 400 lb. compared with 5,779,000 bales for 1937-38. The yield per acre declined to 87 lb. from 90 lb. in the previous season. Exports showed a considerable increase, totalling 3,302,000 bales as against 2,148,000 bales in 1937-38. The consumption of Indian cotton by Indian mills touched a new record at 3,120,000 bales, compared with the previous season's figure of 2,994,000 bales.

The usual statistical tables are included in the report dealing with cotton acreage; production; world supply, distribution and stocks of Indian cotton; consumption by mills in India; exports; Bombay cotton prices, etc.

5. INDIAN COTTON MARKETING. By C. P. Bramble. (*Times Trade and Eng., April Supplmt.*, 1939. From *Summ. of Curr. Lit.*, xix., **13**, 1939, p. 378.) An explanation is given of the system of dealing in "options" on the Bombay market. Improvements in baling are mentioned, but it is said that the system of marking bales with the factory of origin is embarrassing to exporters. The prospects of increased trade with Lancashire are discussed.

6. INDIAN COTTON MANUFACTURING INDUSTRY: RECENT DEVELOPMENTS. (*Times Trade and Eng., April Supplmt.*, 1939. From *Summ. of Curr. Lit.*, xix.,

13, 1939, p. 412.) Trends in the cotton industry of India are discussed, including (1) the organization of labour and improvement of mill conditions; (2) the introduction of modern machinery for spinning, weaving, printing, mercerizing and finishing; (3) the breakdown of conservatism and the development of a "fashion" outlook, due to the sale of cheap Japanese rayon fabrics; and (4) the prospects of Lancashire and the Indian manufacturer in face of Japanese competition in India.

7. INDIAN HAND-LOOM WEAVING INDUSTRY. By K. S. Rao. (*Times Trade and Eng., April Supplnt.*, 1939. From *Summ. of Curr. Lit.*, xix., 13, 1939, p. 412.) Until 1900 weaving in India was almost entirely a hand-loom industry, which produced about 27 per cent. of the 3,200 million yards of cloth then consumed in the country. During the past five years some 400 mills employing fewer than half a million people have produced annually on an average 1,000 million lb. of yarn and 3,500 million yards of cloth, whilst some 2 million hand looms, providing mostly part-time occupation for 8 to 9 million people, have produced about 1,250 million yards of cloth. Measures for improving the hand-loom industry by education, the development of better implements, and improved marketing are reviewed. They have not yet achieved much success.

8. AMERICAN COTTON AND THE INDIAN TEXTILE INDUSTRY. (*Int. Cott. Bull.*, xvii., 67, 1939, p. 325.) The two dominant factors responsible for the decline in consumption of American cotton in India are stated to be, first, and by far the most important, increased manufacture of piece-goods by Indian mills, accompanied by drastic curtailment in imports of British cotton piece-goods that were only partially replaced by imports from Japan; second, and less significant, reduced consumption of cotton goods, attributed to a decreasing purchasing power of the Indian people and to the effects of a high tariff.

9. THE COST OF PRODUCTION OF CROPS IN THE PRINCIPAL SUGAR-CANE AND COTTON TRACTS OF INDIA. (*Agr. and Livestock in India*, ix., 6, 1939, p. 722.) Discussions between the Imperial Council of Agricultural Research and the Indian Central Cotton Committee resulted in the setting up in 1932 of a Joint Sub-Committee of these two bodies to organize and finance an enquiry into the costs of production of sugar-cane, cotton, and some other important crops. The results of the enquiry have recently been published by the Imperial Council of Agricultural Research in eight volumes, covering the years 1933-34, 1934-35 and 1935-36, and dealing with the sugar-cane, cotton, and other crops in the Punjab, Bombay, United Provinces, Madras, Bihar, Bengal, Sind, Mysore, Hyderabad (Deccan), and Baroda.

10. REPORT OF THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, 1938-39. (Pubd. by Manager of Pubns. Delhi, 1939. Price Rs. 1, As. 8, or 2s. 3d.) An account of the work of the year in connection with agricultural research schemes, animal husbandry, soil problems, sugar industry, and locust control.

11. INDIAN FARMING. (Pubd. by Manager of Publications, Civil Lines, Delhi, 1940.) We have received a copy of this new journal issued by the Imperial Council of Agricultural Research in January last. The publication takes the place of *Agriculture and Livestock in India* and is intended principally for cultivators and those who are furthering the work of rural development and are interested in any branch of farming. The price per copy is 8 As., annual subscription Rs. 6. We wish the new journal every success.

12. INDIAN CENTRAL COTTON COMMITTEE. The report of the fortieth meeting of the Committee, held on August 3 and 4 last, contains the presidential address, and gives in summary form a large number of final or progress reports covering a wide range of subjects concerning Indian cotton growing and marketing. These include many schemes for breeding, seed distribution, survey and extension;

special projects for the control of pests and diseases; and recommendations for new research. In the report of a sub-committee on physiological failure in the Punjab, reference is noted to the need for acknowledging the lead given by Dr. Mason, while the Committee records appreciation of the assistance, in the form of advice and seed, given by Mr. J. B. Hutchinson to work on long-staple cotton in Sind. A decision has been taken to publish annual reports of the cotton research stations on the lines of the progress reports published by the Empire Cotton Growing Corporation.

13. INDIAN CENTRAL COTTON COMMITTEE. At the cold weather meeting of the Committee held at Coimbatore on January 19 and 20 last the following matters were discussed: the question of the exclusion of 289F/K25 cotton from the list of trade varieties of Indian cotton tested annually at the Technological Laboratory; complaints regarding the incorrect marking of bales; the prejudice against white fuzzy American cotton seed; the reorganization of the Indore Institute of Plant Industry; the installation of a pilot plant for the manufacture of chemical cotton at the Technological Laboratory, Bombay; the defects of the All-India Cotton Forecasts; the use of cotton cloth for covering cotton bales; the provision of adequate funds for the work of seed distribution in Madras. The progress reports of the various research schemes were considered, and three new schemes were sanctioned.

14. INDIAN CENTRAL COTTON COMMITTEE: REPORT OF THE TECHNOLOGICAL LABORATORY, 1938-39. (*Ind. Cent. Cott. Comm.*, 1939. Price 6 annas.) Administrative report showing the scope of the work undertaken. During the period under review 635 samples of different cottons were received for tests, and the Spinning and Research Laboratories and the Moisture Testing Section were fully occupied. Nine bulletins and forty-eight circulars were issued, five papers were contributed to various journals, and in addition three papers by Dr. Ahmad, in collaboration with other authors, were read at the Indian Science Congress in January, 1939.

15. INDIAN COTTON: STATISTICS. We have received from the Indian Central Cotton Committee copies of Statistical Leaflets Nos. 2, 3, and 4, 1938-39, giving information regarding the following: Stocks of Indian raw cotton held in India by the mills and the trade on August 31, 1939; receipts at mills in India of raw cotton classified by varieties, 1938-39 season; exports by sea of Indian raw cotton classified by varieties, 1938-39 season.

16. INDIAN COTTONS: HAIR-WEIGHT AND SPINNING QUALITY. By N. Ahmad. (*Ind. Text J.*, **49**, 1939, p. 285. From *Summ. of Curr. Lit.*, xix., **13**, 1939, p. 402.) Tests on the influence of fibre weight per inch on the spinning quality of Indian cottons were conducted on a group of five botanically interrelated strains grown in the 1936-37 season. The following conclusions were reached: (1) An increase in the mean fibre weight per inch of a cotton would, in general, be followed by a decrease in thelea strength of yarns spun from it. (2) This decrease may to some extent be arrested if the cotton possessing a high fibre weight per inch also possesses high fibre strength. (3) The decrease would be accentuated if the increase in the fibre weight per inch is associated with a decrease in fibre strength.

17. SPINNING TEST REPORTS ON INDIAN COTTONS, 1938-39. By N. Ahmad. (*Tech. Circs. Nos.* 404, 407-14. 1939. *Ind. Cent. Cott. Comm.*) The circulars contain the grader's report and spinning test results for Westerns cotton; the report of the Standards Committee and spinning test results for Kadi-Viramgam, Farm Westerns, Upland, Bijapur, and Jayawant cottons; the report of the Special Appeal Committee for African cottons and spinning test results for A.R. Busoga, A.R. Jinja, and A.R. Kampala cottons for the 1938-39 season.

18. TECHNOLOGICAL REPORTS ON INDIAN COTTONS, 1938-39. By N. Ahmad. (*Tech. Circs. Nos. 403, 405, 406. 1938-39. Ind. Cent. Cott. Comm.*) The particulars given include agricultural details, grader's report, fibre particulars, spinning test results, remarks and conclusions.

Jayawant (Kumpta).—Area under cultivation 324,400 acres. Yarns are less neppy than previously. Suitable for 38's warp.

Punjab-American 4F.—Area under cultivation 957,500 acres. Yarns are distinctly neppy. Suitable for 22's warp.

Punjab-American 289F.—Area under cultivation 143,400 acres. Yarns are neppy. Suitable for 48's warp.

19. TECHNOLOGICAL REPORTS ON STANDARD INDIAN COTTONS, 1939. By N. Ahmad. (*Tech. Bull., Ser. A, No. 49. 1939. Ind. Cent. Cott. Comm.*) The reports contain the results of tests on standard Indian cottons for the seasons 1924-39. As in former years the agricultural details, grader's report, fibre particulars, spinning tests and remarks are given for each of the twenty varieties tested. Six cottons showed an improvement over last season, three gave the same performance, while the remainder showed a falling-off. The improvement was most marked in two Madras cottons—Nandyal 14 and Hagari 1—and less so for the two Punjab cottons, P.A.289F and Mollisoni.

20. TECHNOLOGICAL REPORTS ON TRADE VARIETIES OF INDIAN COTTONS, 1939. By N. Ahmad. (*Tech. Bull., Ser. A, No. 50. 1939. Ind. Cent. Cott. Comm.*) The report of the Standards Committee and of the Special Appeal Committee, and spinning test results for the 1938-39 season, are given for eighteen varieties of cotton supplied by the East India Cotton Association, and the grader's report and spinning test results for twelve cottons supplied by the Bombay Millowners' Association and two by the Ahmedabad Millowners' Association.

21. COTTON IN BARODA. (*Text. Wkly., xxiv., 602, 1939, p. 326.*) The best of the improved cottons now grown in Baroda is 1027 A.L.F. A marketing office has been opened at Surat and pooling centres established in the cotton areas. The Baroda Government sanctioned a loan of £11,250 for advances to growers against cotton delivered at the pools. The pooling stations were situated at five important centres at which five cotton sale societies and four groups of growers pooled their cotton. The total number of bales for the 1939 season was 2,760, as against 2,164 in 1938. Of these 428 bales were of "A" grade, 1,833 of "B" grade, and 499 of "standard" grade. The average premium received for 1027 A.L.F. cotton over local Surat was 11s. 7½d. per 784 lb. (or two bales) of ginned cotton. The growers received more for their cotton by selling through the marketing organization than by selling direct. There was a good demand for seed for the 1940 season, and a greatly increased yield is anticipated.

22. BOMBAY COTTON ANNUAL, 1938-39, No. 20. (East Ind. Cott. Assn., Ltd., Bombay. Price Rs. 1-8-0.) We have received a copy of this authoritative compendium of all matters relating to every branch of the cotton trade. The first section contains the Eighteenth Annual Report of the East India Cotton Association for the year 1938-39. Further sections include numerous statistical tables of crops, exports, imports, prices, stocks, consumption, Government notifications, etc. The publication is designed to meet the requirements of all who are interested in the production, distribution, and consumption of Indian and foreign cottons, yarn, and cloth.

23. COTTON GROWING IN HYDERABAD STATE (Vol. I). By K. Sawhney. (G. Claridge and Co., Ltd., Bombay, 1939.) This report presents a comprehensive account of cotton production in Hyderabad, based on a special survey made in the years 1931-35. The average crop in 1930-34 was close on half a million bales

grown on some $3\frac{1}{2}$ million acres, and is about one-tenth of India's production. The main feature of the work was a botanical survey carried out with unusual detail, in which not only were representative fields examined all over the country, but typical samples of seed were obtained from each sub-district and grown on a central farm; 200 plants of each sample as grown were then classified into their species and varieties in order to determine the proportions of each occurring in the crop. The classification used is that of Gammie, but a key is given relating this to the later scheme of Hutchinson and Ghose. The opportunity was used to select from this material, as well as from the fields inspected, any outstandingly desirable or distinctive plants. In addition information was collected on a detailed schedule covering agricultural and commercial practice.

The crop is almost entirely rain-grown, and the most usual rotation is with sorghum, to which the available manure is applied. Much of the soil is "black cotton soil" (*regur*), sometimes interspersed with red laterite earth. There are other areas of red soil derived from granite, coarse grained or very sandy in parts. Seed at rates from 14 to 24 lb. per acre is usually sown with wooden drills in lines 12-22 inches apart: the practice of thinning is unknown. Pink bollworm and *Earias* cause losses of about 20 per cent. annually. Jassid attacks American varieties, with severe effects in very dry seasons. The general average yield per acre is about 60 lb. of lint.

Of the types grown the superior Gaorani or Bani, noted for strength and silkiness, nominally occupies about a million acres. In the south almost pure crops of American varieties are grown on a fairly large scale. In both cases there has been a slow infiltration of short staple types, preferred by the cultivator for their heavier yield. Both areas are now protected—i.e., steps are taken to control seed supply and improve marketing in order to maintain the long-stapled varieties. In the Gaorani areas the dominant species is the indigenous *Gossypium indicum*, with *G. hirsutum* of American origin as the other main component. In other districts *G. herbaceum* is grown almost without admixture, while varieties of *G. neglectum* are predominant in the border districts, extending inwards in diminishing proportion. The report supplies particulars of the true-breeding strains selected for further study and trial.

A long list is given of detailed recommendations based on the survey, including the prospect of another 100,000 acres annually of irrigated cotton, and possible extensions on soils not at present utilized for cotton.

24. MADRAS: COTTON CULTIVATION, 1937-38. (Ann. Rpts. of various stations, 1937-38, received 1940.) At Coimbatore drought conditions prevailed for the fourth successive season, and crops suffered severely in consequence. The weather was helpful to some extent in checking the multiplication of the cotton stem weevil (*Pemphres affinis*). The main work on cotton was concerned with the improvement of the Cambodia and Salems varieties. Cambodia 1742 continued to be the most promising cotton at Guntur Station. In mixed cropping trials of 1742, groundnuts, horra, and paddy, cotton with groundnuts gave the best monetary return. In yield trials carried out at Hagari Station between H-1 and 15 Asiatic and 4 American cottons the best yields were obtained from H-1. At Koilpatti Station, Koilpatti No. 1 proved superior in yield to 21 Coimbatore selections received from the Cotton Specialist, and at Nandyal Station, N.14 and local cottons gave better yields than Hyderabad Bani, Jayawant and H-1 varieties.

25. THE CULTIVATION OF CAMBODIA COTTON IN THE CENTRAL DISTRICTS. By A. Kannayya. (*Madras Agr. J.*, xxvii., 8, 1939, p. 274.) Advocates the growing of Cambodia cotton as a much-needed cash crop in the Central Districts of Madras, contrasting the situation in this respect with that of Coimbatore, where cotton and tobacco successfully serve this purpose.

26. THE MAIN CAUSE OF CROP FAILURE IN THE BLACK SOIL TRACT OF THE BELLARY DISTRICT. By C. Vijayaraghavan and V. Panduranga Rao. (*Madras Agr. J.*, xxvii., 8, 1939, p. 271.) The special conditions of this district—a heavy clay soil (58 per cent. clay), low rainfall in sudden heavy downpours, and rapid evaporation—are liable to give rise to a hard layer 6 to 9 inches thick under the top 2 inches of loose, friable soil. Rain seldom falls after the crops are planted, and the roots of seedlings find great difficulty in penetration. The effect on tap-rooted plants such as cotton is a degree of mechanical strangulation. When the layer is formed late it hastens maturation. Bunding and fallowing, by conserving moisture, delay its formation; crops of short duration have the best chance of evading its effects.

27. IMPROVEMENT OF CROPS IN MYSORE: A REVIEW OF TWENTY-FIVE YEARS' WORK. By V. K. Badami. (*J. Mysore Agr. Exp. Union*, 17, 1938. From *Pl. Bre. Absts.*, x., 1, 1940, p. 1.) Much breeding work has been done on cotton. Selections of local Sannahatti (*Gossypium herbaceum*) were made at an early stage, and the strain S.69 is now the main commercial type. Later crosses were made between *G. arboreum* and *G. herbaceum* in order to develop a cotton equal to Broach in quality. Two valuable strains, H.190 and strain 19, were produced. H.190 has quality quite as good as Broach Deshi 8, a ginning outturn of 30 per cent., a staple length of $7\frac{7}{8}$ to 1 in. and yields nearly as well as local Sannahatti. Cottons have been bred to replace Bokda, an inferior *neglectum* variety, and attention has also been paid to American Upland types. The variety M.A.11, produced by crossing Peruvian tree cotton and the local acclimatized Upland type, Doddahatti, is now widely grown. A collection of cotton species has been assembled and some interspecific crosses have been attempted in an effort to breed for resistance to red-leaf disease. Efforts to produce X-ray mutants of enhanced economic value have so far failed.

28. THE PUNJAB AS A PRODUCER OF STAPLE COTTONS. By H. R. Stewart. (*Seasonal Notes*, Punjab Agr. Dpt., xviii., 2, 1939, p. 9.) The Punjab holds the first place in India as a producer of cotton. In 1938-39 Punjab-American types were grown on 1,492,000 acres, representing 51.2 per cent. of the total area under cotton in the Province. This was the first occasion on which medium and long staple cottons occupied more than half the total cotton area. The most important of the high-medium and long staple types grown are 289F, 289F/43, 289F/K.25 and L.S.S. Certain of the strains, though excellent in most respects, have the disadvantages of susceptibility to jassid attack and of low ginning outturn, and active research is being pursued to evolve still better varieties which not only retain the good qualities of the long staple types now grown, but are free from these defects.

29. A NEW STRAIN OF DESI COTTON FOR SOUTH-WESTERN TRACT OF THE PUNJAB. By C. M. Afzal. (*Seasonal Notes*, Punjab Agr. Dpt., 18, 1939, p. 9. From *Pl. Bre. Absts.*, ix., 4, 1939, p. 385.) The new cotton variety 119 Sanguineum has now been released by the Cotton Research Station, Lyallpur, Punjab. It is recommended for the south-western portions of the Punjab and has a ginning outturn of 35 to 36 per cent., higher than any other Sanguineum cotton. It is very early maturing, has white lint of attractive appearance, is drought resistant and gives high yields.

30. SIND: SEA ISLAND COTTON—GROWTH IN INDIA. By N. Ahmad. (*Nature*, 1939, 144, p. 785. From *Summ. of Curr. Lit.*, xix., 22, 1939, p. 629.) Sea Island cotton has been grown in Sind for at least ten years. Since 1930-31 samples from the Government Farm, Sakrand, have remained fairly steady at a staple length of about $1\frac{1}{4}$ inches and fibre weight per inch of about 0.117×0.6 oz.—that is, it has not reverted to the local *neglectum* type with staple 0.7 inch and fibre weight

about 300. In 1935-36, 1,400 acres were under Sea Island cotton, but the poor yield (700 bales) did not give the cultivators sufficient return for their labour, and the area has diminished.

31. UNITED PROVINCES: COTTON INDUSTRY, 1937-38. (*Rpt. on Admin. of Dpt. of Agr., 1937-38.*) "The programme of providing improved varieties for the Province includes the simple selection of the best strains from material derived from an extensive survey of the indigenous Bengals crop, from cultures of the established strains C.402 and C.520, and from among short and medium staple types from the Punjab, Central Provinces and Central India, and improvement by hybridization. The greater part of the work of the year fell under straightforward selection. The production of mutant varieties by treatment with short wave radiation was also taken up, but this treatment could not be given in time, and the method will be followed up next season."

Material was available for selection as a result of field surveys financed by the Indian Central Cotton Committee and departmentally. None of the outside short staple strains equalled C.520. Of long staple cottons the Province has a very promising strain in Perso-American, which should compare favourably with the best of the Punjab-American types. C.520 is rapidly becoming the standard cotton for the western cotton tract. Active measures are being taken for better control of pink bollworm.

COTTON IN THE EMPIRE (EXCLUDING INDIA).

32. The following reports have recently been received:

CEYLON: Admin. Rpt. of Actg. Dir. of Agr., 1938.

CYPRUS: Ann. Rpt. of Dpt. of Agr., 1938.

FIJI: Ann. Bull. of Div. Rpts., 1938.

KENYA: Ann. Rpt. of Dpt. of Agr., 1938, Vols. I. and II.

MALTA: Ann. Rpt. of Dpt. of Agr., 1937-38.

NYASALAND: Ann. Rpt. of Dpt. of Agr., 1938.

„ Ann. Rpt. of Med. Entomologist, 1938.

QUEENSLAND: Ann. Rpt. of Queensland Cott. Bd., 1939.

SOUTH AFRICA: Ann. Rpt. of Dpt. of Agr. and Forests, 1938-39. (*Farming in South Africa*, December, 1939.)

SUDAN: Ann. Rpt. of Dpt. of Econ. and Trade, 1938.

„ Admin. and Finan. Rpt., 1938.

TANGANYIKA: Ann. Rpt. of Dpt. of Agr., 1938.

UGANDA: Ann. Rpt. of Dpt. of Agr., 1938, Pt. I.

WEST INDIES:

Antigua : Rpt. of Agr. Dpt., 1938.

Barbados : Agr. Jour., Dpt. of Agr. and Sci., VIII., 1 and 2, 1939.

Grenada : Ann. Rpt. of Dpt. of Agr., 1938.

Montserrat : Rpt. of Dpt. of Agr., 1936-38.

St. Kitts-Nevis : Rpt. of Dpt. of Agr., 1938.

St. Vincent : Rpt. of Agr. Dpt., 1938.

33. PROGRESS REPORTS FROM EXPERIMENT STATIONS, 1938-39. (Pubd. by the Empire Cotton Growing Corporation, 1940. Price 3s. post free.) Progress reports are included summarizing the work carried out during the season at the Cotton Experiment Stations in Queensland, South Africa, Swaziland, Rhodesia, Sudan, Uganda, Tanganyika, Nyasaland, St. Vincent, Trinidad, and the Seed Farm in Nigeria. Reports on the work in the Northern and Southern Provinces of Nigeria, and on Entomological Investigations in those Provinces, are included by courtesy of the Nigerian Government. The important breeding work with U.4 and its derivatives continued to show good progress in South Africa, Southern

and Northern Rhodesia, Uganda, in some districts of Tanganyika, and in Queensland. Useful work was continued with varietal trials, rotation of crops, and fertilizer experiments. The research work on cotton pests and diseases continued to produce reliable information on many questions of great fundamental importance. A new feature in the present volume is the inclusion of Programmes of Experiments for the various Stations for the 1939-40 season. The reports should prove of much interest and value to those concerned with the cultivation of cotton and similar crops.

34. A REVIEW OF THE WORK OF THE EXPERIMENT STATIONS, SEASON 1938-39. By W. Nowell. **NOTE ON THE ENTOMOLOGICAL WORK.** By J. W. Munro. (Pubd. by the Empire Cotton Growing Corporation, 1940. Price 1s. 6d. post free.) A very useful discussion of the general lines of development in Africa is followed by the authors' comments on those features of the year's work concerned with agricultural practice, plant breeding, the control of pests and diseases, which have reached a stage which gives them interest for the general reader, to whom this review is addressed.

35. IMPERIAL INSTITUTE. The Annual Report for 1939 describes the work carried out during the year, and the measures taken to convert the Institute from a peace-time into a war-time machine. In the Plant and Animal Products Department 1,191 enquiries were dealt with, and reports furnished on 434 samples. In the Mineral Resources Department 1,097 enquiries were dealt with, and reports furnished on 110 investigations involving the examination of 322 samples. 4,129 new books, official reports, and pamphlets were added to the Library during the year.

36. EUROPE. MALTA: COTTON CULTIVATION, 1937-38. (*Ann. Rpt. Dpt. of Agr.*, 1937-38.) Cotton was grown on 46 acres, including 39 acres in Gozo. Last year's acreage amounted to 51 acres. Production was estimated at 10,400 lb. compared with 11,060 lb. for the preceding year. Production was under average and prices remained low as before.

37. ASIA. CEYLON: COTTON INDUSTRY, 1937-38. (*Admin. Rpt. of Actg. Dir. of Agr.*, 1938.) Heavy rains at the time of ripening and harvesting caused a reduction in yield and quality of the crop. The Provident Investment Company, which was under contract to pay Rs. 12 per cwt. for first-grade seed cotton, stated that the cotton was not of first grade, and a reduced price of Rs. 11.70 per cwt. was accepted by the Agricultural Department. A satisfactory feature of the year was the extended popularity of the crop in the North-Central Province where, in spite of unfavourable weather, a sum of Rs. 5,284.76 was paid to cultivators compared with Rs. 2,620 in 1937. There was an increased demand for cotton seed for the 1938-39 *maha* season, but owing to the failure of the monsoon many lands were abandoned.

With a view to the introduction of a superior variety of cotton into the country, experiments were carried out with S.G.29 (Uganda), U.4/4 (South Africa) and Cambodia Co.2. The staple of Cambodia Co.2 was longer than the other two strains, but these gave higher yields.

38. WORK IN PROGRESS IN THE BOTANICAL DIVISION OF THE DEPARTMENT OF AGRICULTURE. (*Trop. Agr.*, xciii., 2, p. 77. Peradeniya, Ceylon, 1939.) Reference is made to a small but regular cotton-growing industry which supplies the mills in Colombo. Its main area of operation is the Hambantota district, but recently it has spread to the dry areas of the northern part of the island. Last year it produced 355 bales. The variety grown is Cambodia; two African varieties have shown promise in trials.

39. CYPRUS: COTTON INDUSTRY, 1938. (*Ann. Rpt. of Dpt. of Agr.*, 1938.) The year was a poor one for the cotton industry owing to adverse weather conditions

during the sowing season, late maturity, sunscorch and diseases. The Cotton Law (1937) came into full operation during the year, and Mesowhite cotton was grown in six segregated areas to the exclusion of local types; yields, however, were low, due to the poor weather conditions experienced. The cotton from segregated areas was ginned under supervision and the seed reserved for issue in further segregated areas in 1939. Cotton experiments carried out during the year included time of sowing, spacing, fertilizer, and irrigation trials. In a cotton varietal trial several American strains proved superior to Mesowhite and the local cotton.

40. COTTON CULTIVATION. (*Cyprus Agr. Journ.*, March, 1939, p. 13.) Includes yields of cotton variety trials, date of sowing, irrigation and dry cultivation, and fertilizer experiments.

41. AN ANALYSIS OF FARMING COSTS IN CYPRUS. By H. M. James and C. C. Koumides. (*Bull. No. 6, Dpt. of Agr., Cyprus, 1939.*) Includes details of the cost of production of cotton planted after summer crops.

42. AFRICA. KENYA: ANNUAL REPORT OF DEPARTMENT OF AGRICULTURE, 1938. Vols. I. and II. The complicated structure of Kenya agriculture, with its wide diversities of climate, crops and people, is reflected in the multitude of activities recorded in this report. There is evidence of more concern with native production and of determined efforts to face the difficulties involved in the conservation of soils and fertility.

The weather exhibited its usual irregularities, which were not, however, extreme. Export prices remained moderate or low, and interest in the production of cotton, which was in the latter category, suffered severely. The newer crops for European farmers—pyrethrum and passion fruit juice—maintained their popularity. The prospects of a revival of the flax industry were being considered. Work was begun at Thika on a new station for the investigation of the agronomic problems of sisal-growing at high altitudes, complementary to the low-level station near Tanga in Tanganyika Territory.

The table of native exports shows the value of hides and skins (£187,000) as the highest figure, followed by cotton (£104,000) and wattle products (£90,000) next in order. There was a record export of potatoes (£39,000).

Apart from the effect of low prices the cotton crop was reduced by uneven rainfall distribution, and in the Coast Province by severe jassid attack. The total export for the 1938-39 season was under 10,000 bales, half the previous crop, and less by 12,000 bales than the highest attained (in 1936-37). Nyanza Province fell to 8,619 bales (maximum 17,840), Central to 549 (maximum 3,730) and Coast to 818 (maximum 1,486). Flower and boll shedding were severe in all areas, and in an analysis made in the Coast Province the action of some unknown factor concerned in this was indicated and investigations instituted. The prevalence of jassid at the Coast involved even the Barberton and Southerd Rhodesian strains, hitherto resistant. Harland's Cambodia crosses shown greater resistance, A.F.C.15 being outstanding.

Great progress has been achieved by the encouragement of mixed farming in native areas of the Central Province, where it is now an established practice with many, and the time when it will be the rule rather than the exception is regarded as not far distant. In the Nyanza and Coast Provinces the efforts made have met with little success. In Nyanza persuasion has been turned away from compost making to the use of the large quantities of *boma* manure lying idle in the villages, with success where it is reinforced by pressure of population. In some areas this pressure is being exerted by concentrations as high as 1,000 to the square mile. There appears to be a general decline in the soil fertility of these areas which can only be met by the better use of cattle. In the Coast

Provinces one settlement scheme of 10,000 acres has been started and others are in prospect. At the Kibarani Experiment Station fertility and renovation experiments are in progress.

Results will be awaited with close interest of the expenditure of a loan of £23,000 made from the Colonial Development Fund to the Machakos Native Council for anti-erosion measures, and of the free grant of £10,000 for the comprehensive treatment of 100,000 acres as an experiment and practical demonstration "to ascertain what can be done to save the Reserves in Kenya from absolute destruction."

43. NIGERIA: COTTON INDUSTRY, 1938-40. (*Half-yrly. Rpt. of Dpt. of Agr. to September 30, 1939.*) *Northern Provinces.*—Production for 1938-39 reached 21,268 bales. Over 92 per cent. of the crop was graded NA.1, the ginning percentage being 31.39. The total amount of seed distributed for the 1939-40 season was 4,724 tons, an increase of $5\frac{1}{2}$ per cent. over last year. The main increases were in Katsina and Kano Provinces; Zaria and Sokoto showed a decline of 157 and 117 tons respectively. It was anticipated that with good rains in October the yield per acre would be well above average. Last year's prices were so low that many farmers preferred to keep their cotton for local spinning rather than sell it for export. If there is an increase in the price offered this year more cotton will be brought for sale in the cotton markets, and the export crop will be correspondingly greater.

Southern Provinces.—Some 2,600 bales of Ishan cotton were produced in 1938-39, 82 per cent. of the crop being grade 1. The very low prices paid for the cotton resulted in a poor demand for Ishan seed for the 1939-40 season's planting, only 11 tons being sold as against 31 tons last year.

44. REPORT ON NIGERIAN TRANSPORT. By F. Smith. (Reviewed in *Crown Colonist*, December, 1939, p. 637.) Following the recent retirement of Mr. G. V. O. Bulkeley, Director of Transport, the future of the transport organization of Nigeria is under consideration, and a report has been submitted to the Governor by Mr. F. Smith, Transport Manager of Lever Bros. and Unilever Ltd. The main part of the report is concerned with the proposed reorganization of the railway system, as to which Mr. Smith makes drastic recommendations. He proposes the abolition of the transport directorate, the restoration of the railway administration to its previous status, the separation from it of the port services, the reorganization of railway operation methods, a levy on all tonnage, an intensive trade drive, and the setting-up of a co-ordinating authority for all forms of transport in the form of an executive committee representative of the railway, public works, agriculture, marine, trade, road, and river services. The report praises the general efficiency and skill of Africans in the railway and other transport services, and recommends their further recruitment, and their suitability for appointment to higher-grade posts.

45. MIXED FARMING IN NORTHERN NIGERIA. PT. I. ORIGIN AND PRESENT CONDITIONS. PT. II. EDUCATION, LAND TENURE, AND FUTURE PROBLEMS. PT. III. A BRIEF COMPARISON OF CONDITIONS IN NORTHERN NIGERIA AND TANGANYIKA. By J. G. M. King. (*Emp. J. Exp. Agr.*, vii., 1939, pp. 271 and 285.) In Nigeria the extension of mixed farming is undertaken entirely through the Native Administrations. The success of the system, which can be judged by the fact that mixed farming is now beginning to take a place in native agriculture, was undoubtedly due to the care exercised in developing this system of farming, and to the trouble which was taken to convince the Native Administrations of its value, before any attempt was made to apply it to native agriculture. It was not until their confidence had been won that they were approached with a view to supporting the scheme. An important factor

contributing to its success is that the system has been kept on the simplest basis. Mixed farming has been directly grafted on to the existing native agriculture with as little disturbance as possible. A farmer merely obtains cattle, builds a pen, and starts on his present farm to adopt the methods of improved agriculture. The first step is to get him to make and use manure, and to look after his cattle, and until this is done there is no attempt to get him to make any other improvements. The system is designed to suit both large and small farmers. For example, around Maigana in the Zaria Province, it was interesting to note that there were two distinct types of mixed farmers. Firstly, the "intensive" mixed farmer who works on a 10 to 12 acre basis with his pair of bullocks, and who manures his land with pen-manure, and secondly, the "extensive" mixed farmer who has too many cattle to house in a pen, and who manures his land by intensive "kraaling." This second type of farmer is generally a settled Fulani or progressive Hausa, who cultivates 20 acres or more.

In Tanganyika conditions are more diverse and circumstances more complicated. Quite apart from the introduction of animal husbandry into native agriculture, concomitant problems such as tsetse-fly, East Coast fever, and in the semi-arid regions the resultant evils of overstocking and erosion, all have to be faced.

46. NYASALAND: ANNUAL REPORT OF DEPARTMENT OF AGRICULTURE, 1938. (Received 1939.) Tea, value £448,000, took first place in exports, followed by tobacco, £392,000. Of the tobacco, 3,000,000 lb. (mostly flue-cured) was produced on European-owned estates and 15,000,000 lb. (fire- and air-cured) by natives. Cotton exports increased considerably in quantity (3,060 tons as compared with 2,066 tons in 1937), with a value reduced from £105,722 to £99,953. The increase was due to good climatic conditions in the Lower River area. It is estimated that seed cotton enough to provide a further 750 tons of lint was sold across the Shire in Portuguese territory. This movement is attributed to higher prices, dissatisfaction with the new marketing system, and avoidance of market taxes.

New marketing systems were introduced for both the principal native crops, tobacco and cotton. Native Trust Land tobacco was purchased by the Native Tobacco Board at the price estimated to be realizable at auction, less a charge to cover expenses, including all the activities of the Board. The system for cotton was based on the sale by auction of the sole right and obligation to purchase all seed cotton brought to a particular market at the price bid per pound for the cotton coming into that market. This system resulted in prices better related to market values than in previous years, but the actual fall in price and the absence of competition caused dissatisfaction. The sum paid out to Trust Land growers was £39,687, with possibly £20,000 for sales over the border.

Red bollworm (*Diparopsis*) continued to be the principal pest of cotton; the general incidence was severe, and the crop of the Blantyre and Central Shire districts was greatly reduced. Internal boll disease destroyed the late crop in some areas. Efforts were made to increase the effectiveness of the close season by insistence on more uniform uprooting of cotton plants.

Considerable progress is reported in soil conservation measures, mainly from the advocacy of contour ridging. Activity is shown in the experimental manufacture of compost.

47. NYASALAND: ANNUAL REPORT OF THE MEDICAL ENTOMOLOGIST FOR 1938. In the report the Medical Entomologist refers to the great value of developments in cotton growing in assisting tsetse control by promoting land clearance, and appreciation is expressed of the work of the Empire Cotton Growing Corporation in this connection. The Corporation established an experiment station at Domira Bay in 1929, with a view to the development of the whole of the fly-infested area

under cotton, and a considerable measure of success has been achieved. Lands of potential value for cotton cultivation have been made available for settlement by the provision of water supplies from wells and bore-holes, and in the year under review 2,250 natives in the area were engaged in the cultivation of cotton.

48. COTTON INDUSTRY, 1938-39. (*Crown Colonist*, March, 1940, p. 147.) In the Lower River area, where the greater part of the cotton is grown, the season was disastrous. The floods in the early months of the year were heavy and widespread. Much of the land usually planted to cotton was submerged, and, discouraged by the weather and by the low prices, many growers abandoned their gardens.

49. SOUTH AFRICA: COTTON INDUSTRY, 1938-39. (*Ann. Rpt. of Dpt. of Agr. and For.*, 1938-39. From *Farmg. in S. Afr.*, December, 1939.) The season opened with good planting rains and favourable growing conditions, but owing to the continued low prices—and no indication of any advancement—farmers were very discouraged, and consequently planted only a small acreage. The quality, particularly that of the Natal crop, has been most satisfactory, and the percentage of off-coloured cotton is decreasing, showing that insect pests are to some extent being controlled, probably due to strict farming methods and less ratooning.

Under the guidance of the Native Affairs Department Agricultural Section, natives have grown excellent cotton this season. Although the crop is cultivated only on a small scale the results are nevertheless encouraging.

The consumption of cotton lint within the Union is advancing yearly, and unless the country produces more cotton it is probable that within a few years this commodity will have to be imported. Prices paid by South African factories are good, and well above offers for export.

At the Corporation's Cotton Experiment Station at Barberton, seed selections, variety trials, fertilizer experiments, insect pest control and physiological work are being carried out with cotton. Crops such as soybeans, maize, sunflower, groundnuts, etc., which have some relation to cotton growing, are given much attention, and exceptionally useful and important investigations are carried out by the staff under the able direction of Mr. F. R. Parnell, the senior officer in South Africa of the Corporation. The Department of Agriculture records its great appreciation of the work of the Corporation, and states that the relations between the two bodies are most cordial.

50. COTTON INDUSTRY PROSPECTS, 1939-40. (*Crops and Markets*, January, 1940, p. 107.) Owing to the substantial advance in price and large enquiries for lint from South African factories, a much larger acreage has been planted than for the past two seasons. Good rains at planting time have been experienced and the crop is progressing favourably. Unless damage is done by drought and locusts, the prospects are decidedly most encouraging. Should the war last any length of time great interest is likely to be taken in the revival of the cotton industry in the Union.

51. COTTON CULTURE IN SOUTH AFRICA. By F. M. du Toit. (*Farmg. in S. Afr.*, xv., 166, January, 1940, p. 4.) A brief discussion of the subject dealing with past production, cotton prices, areas suitable for cotton, cultural methods, harvesting, and by-products. During recent years there has been a great increase in the utilization of locally grown cotton by industrialists in South Africa, and in 1939 production was insufficient to meet local demands. The crop deserves more attention from farmers situated in suitable areas where an ample supply of labour is available at harvest time. The two outstanding varieties of cotton grown are Improved Bancroft and U.4. The former gives good results in the Upington area, while U.4, which is very resistant to jassid, is better adapted to the low veld districts of the Transvaal and Zululand.

52. SCIENCE AND EMPIRE COTTON PRODUCTION. By W. L. Fielding. (Reprinted from *Scientific Worker*, Autumn, 1939.) An article describing the activities of the Empire Cotton Growing Corporation's Station at Barberton, South Africa. The cotton-growing industry in the South African low veld was undoubtedly saved from extinction by the production of the jassid-resistant U.4 cotton at Barberton, and the plant-breeding work carried out there has also definitely benefited such distant countries as Tanganyika, Uganda, Portuguese East Africa, and parts of the Belgian Congo, whilst in South Africa, Swaziland, Northern and Southern Rhodesia, and Nyasaland the cotton now grown is of U.4. descent. The work on insect pest control also has a wide application in the cotton-growing areas in Southern Africa.

53. THE SOUTH AND EAST AFRICAN YEAR BOOK AND GUIDE FOR 1940. (Edited for the Union Castle Mail Steamship Co. Ltd., by A. Gordon Brown.) The forty-sixth edition of this valuable publication contains 1120 pages dealing with all matters relating to South and East Africa. Climate and topography are well treated. The individual States are discussed in detail, followed by sections dealing with labour, native problems, land tenure, co-operation, irrigation, farming, forestry, diseases and pests, mining, etc. For the business man, in addition to general information on imports and exports, there are details of postal and telegraphic regulations, income tax regulations, local weights and measures, currencies, Government officials and representatives abroad, public holidays, etc. The index covering 61 pages contains some 4,000 place names, and is practically a gazetteer. The price of the book is 2s. 6d. (3s. by post in U.K., 3s. 6d. elsewhere)—surely the cheapest volume of its kind in existence—and no one with interests in South and East Africa should be without it.

54. SWAZILAND: WORK ON COTTON AT THE BREMERSDORP AND CROYDON EXPERIMENT STATIONS, 1937-38. By J. V. Lochrie. (*Swaziland Agr. Rev. and Notes for Quarter ended 31/12/38*, p. 7.) Much of the work consisted of trials of new strains selected from U.4. The original U.4, which was a very useful cropper having high resistance to jassid, has been superseded in general cultivation by later selections showing improvement in various ways, such as uniformity, ability to produce good yields under adverse conditions, and in better spinning characters. The strain at present in general cultivation in Swaziland and the low veld areas of South Africa is 052, which is a robust, fairly early type, with a good yield, but its ginning percentage is lower than some of the less productive strains. Seven selections made from 052 with the object of improving the ginning percentage all gave substantially higher yields than 052, and with one exception the ginning percentage was also higher.

55. SUDAN: COTTON INDUSTRY, 1937-38. (*Ann. Rpt. of Dpt. of Econ. and Trade*, 1938.) Ginned cotton exported in 1938 was 62,306 tons valued at £E3,427,181. The ginnery outturn for the current crop was just over 60,000 tons. This export has been exceeded only once (1937, 70,413 tons). 36,991 tons went to Great Britain and 14,334 to India. Export to India fell by 6,639 and to Japan by 2,245 tons. The Gezira produced a very good crop. The areas sown were in round figures 95,000 feddans with X1530A and 110,000 with Sakel. Following a record crop Tokar had one of its very worst seasons, due to a poor flood and adverse climatic conditions. The Gash delta produced an average crop: Domains Sakel on 15,495 feddans, Lecrem on 1,831 feddans and X1730A on 17,109 feddans. Rain-grown cotton showed an increase due to a larger crop in the Nuba Mountains.

56. TANGANYIKA: ANNUAL REPORT OF THE DEPT. OF AGRICULTURE, 1938. The values of agricultural exports suffered a heavy decline during the year, and the economic and political uncertainties special to the Territory submitted the

stability of non-native enterprise and the equilibrium of peasant agriculture to a severe strain. There was, nevertheless, a ready response to the call for accelerated development, and there are good prospects of rapid progress based on the spade-work of the previous decade. The director rebuts vigorously the idea of exploitation of the natives or of the soil, pointing out the very small proportion of the working capacity of the former or the extent of the latter which is at present occupied in production. Only in the Lake Province has the land suffered any visible drain of fertility, and there it is being met by the adoption of more intensive farming. Transport difficulties on the land are leading to the training of pack oxen, and water deficiencies are being remedied by the more progressive tribes building their own tanks and dams by communal effort.

The cotton marketing system in the Lake Province worked smoothly, although the competition which middlemen were expected to supply was eliminated by agreements which virtually converted them into ginneries' agents. The report of an official investigation of cotton marketing in the Eastern Province is under consideration. Cotton remains, in spite of low prices, one of the most profitable crops to the African peasant, and possesses agronomic qualities which make its inclusion in crop rotation highly beneficial. The export was 49,675 bales, of which 4,255 were non-native in origin. An Order was made to the effect that raw cotton shall be sorted throughout the Territory into two grades only.

57. UGANDA: COTTON INDUSTRY, 1937-38. (*Ann. Rpt. of Dpt. of Agr. to December 31, 1938, Pt. I.*) The combination of good weather conditions, early planting and a larger acreage resulted in a record production of 417,179 bales of cotton, of which 402,200 bales were exported. The total number of ginneries working was 143, compared with 140 in the previous season. Ginning pools continued to operate in most zones. Prices paid for seed cotton were lower than in 1936-37. Some 122,000 tons of cotton seed were exported, prices varying between Shs. 21 and Shs. 28/50 per ton f.o.r. Uganda ports and stations. A Cotton Commission was appointed by the Governor in 1938 to enquire into all aspects of the cotton industry and to make recommendations for its improvement. The full report of the Commission was published in March, 1939. [*Cf. Abstr. 388, Vol. XVI. of this Review.*] Considerable progress was made with the work on soil conservation and the prevention of erosion. The Geological Department excavated seven reservoirs in Karamoja and seven in the dry area in Western Masaka. The Drilling Section installed twenty-five boreholes in the Chua area of Acholi district, and a private firm completed twelve boreholes in the Eastern Province. Additional work in this direction will undoubtedly help to solve the difficulty of providing water supplies for stock and in reducing erosion in the more arid parts of the Protectorate.

1938-39 Crop.—Very dry weather delayed planting of both food crops and cotton, and later in the year checked the growth of young cotton plants, with the result that the yield was smaller than in the previous season. The usual pests and diseases were present, but little injury was caused except by *Helopeltis* in Busoga. Seed of the strain S.P.20 (a derivative of U.4.4.2 selected at Serere) proved in field trials to be suited to Usuku County in Teso District owing to its early maturity, resistance to blackarm, good yield and high ginning outturn. The staple is, however, short and harsh, which makes the strain unsuitable for general distribution.

58. COTTON PROSPECTS, 1939-40. The report for the month of February, recently received from the Dept. of Agriculture, states that some loss of crop has occurred owing to heavy rain interfering with the picking of late-planted cotton. Marketing has been hindered by the wet weather, but it is considered that there still remains a substantial proportion of the Buganda crop to be sold.

59. AUSTRALASIA. QUEENSLAND: COTTON INDUSTRY, 1938-39. (*Ann. Rpt. of Queensland Cott. Bd.*, 1939.) The seasonal conditions experienced were favourable, and a good average yield of cotton per acre was obtained. Humid conditions prevailing at the time of harvest, and also a shortage of cotton pickers, necessitated the snapping method again being resorted to, with a consequent lowering of the quality of the cotton. During the season the crop suffered severely from jassid, bollworms, and cutworms, while minor injury was caused by the Rutherglen bug, yellow peach moth, and corn earworm. In addition to supplying insecticides to growers at cost price, the Cotton Board made a grant of £400 a year to the Department of Agriculture for an additional entomologist to devote the whole of his time to cotton insect pest investigation. Breeding and selection work was continued by the Department of Agriculture; the most popular cotton is the Miller variety, which is fairly resistant to jassid attack.

60. PASTURE RENOVATION IN THE CENTRAL DISTRICT—COTTON A FACTOR. (*Queensland Agr. Journal*, lii., 6, December, 1939, p. 707.) In investigations conducted at the Biloela Research Station it has been found that the ploughing of the old grassland for three years' growth of cotton and then replanting Rhodes grass is a very suitable way of bringing the depleted grass paddocks back to normal production. Yields of $3\frac{1}{2}$ tons of air-dried Rhodes grass hay have been produced at the station in the second year of establishment of the grass on forest alluvial soils following cotton. There is not only a restoration in yield of the grass obtained through the use of this rotation, but the quality of the grass also is very much improved for a considerable period. The use of the rotation also definitely improves the yields of cotton, as compared with cotton crops grown on old cultivations. Gains ranging from 20 to 60 and even 100 per cent. have been obtained, both in experiments and commercial crops.

61. THE VALUE OF THE COTTON-GRASSLAND ROTATION. (*Queensland Agr. Journal*, August, 1939, p. 213.) Strongly recommends the cotton-Rhodes grass rotation for farmers who can combine cotton growing and dairying. Advocates cotton as a profitable crop needed to meet an increasing Australian market.

62. FIJI: COTTON INDUSTRY, 1937-39. (*Ann. Bull. of Div. Rpts.*, 1938, received October, 1939.) The industry is only a very small one in Fiji. In 1937-38 season over 250 acres were planted to cotton, but owing to storms and floods in February the resultant harvest amounted to only 60 bales. 60,000 lb. of cotton seed were obtained and found a ready local market. The average return to the grower per acre was estimated at £4 19s. 8d., and the average price of seed cotton was 2.681 pence per lb. Despite the very adverse season, the returns from the industry approximately balanced expenditure.

Prospects for the 1938-39 season were good until the latter half of December, when cyclonic gales and heavy rainfall ruined a high percentage of the area of 500 acres planted to the crop. This was unfortunate, especially as Indians in Vanua Levu had taken up cotton cultivation seriously. At the Sigatoka Experiment Station breeding, selection, spacing, and mixed cropping trials were continued.

63. WEST INDIES: WEST INDIAN COTTON INDUSTRY, 1938-39. (*W. Ind. Comm. Circ.*, 4/4/40, p. 85.) The Sea Island cotton acreage for the season amounted to 15,571 acres, which was slightly in excess of the average of the two preceding years. Production amounted to 4,898 bales. Owing to the increased demand for Sea Island cotton in the manufacture of balloon fabric, disposal of the crop was fairly readily effected at prices ranging from 18d. to 24d. per lb. lint. The production of Marie Galante was 738 bales. It is estimated that over 16,000 acres will be planted to Sea Island and about 6,000 acres to Marie Galante cotton in the 1939-40 season.

64. WEST INDIAN SEA ISLAND COTTON ASSOCIATION (INCORPORATED). The fourth Ordinary General Meeting of the Association was held in Antigua in November last. Matters affecting the industry were reviewed. Available information favoured the conclusion that American competition was unlikely to develop, while spinning tests comparing S.I. with the long staple Egyptian Giza 26 did not support the idea that it would displace S.I. to a serious extent. Waste losses were much larger and the appearance of the yarn inferior. Markets appeared ready to absorb a crop approaching $2\frac{1}{4}$ million pounds in the coming year, and allocations were made on this basis.

65. THE WORK OF THE WEST INDIAN PLANT QUARANTINE STATION FROM 1934 to 1939. By A. M. Adamson and R. E. D. Baker. (*Trop. Agr.*, xvii., 1, 1940, p. 4.) From this paper, submitted to the Imperial Mycological Conference, we extract the following in reference to cotton seed: "Much cotton seed is received and distributed for the Cotton Research Station in Trinidad, and a very satisfactory technique has been developed. Seed is treated on arrival with strong sulphuric acid and then heated to 60° C. for half an hour. It is then grown for one generation in a special quarantine house at the Cotton Station. If necessary it is also fumigated. Seed to be sent away is heated or fumigated, but is not treated with sulphuric acid. A considerable number of foreign insects, including bollworms, have been intercepted. The Plant Quarantine Committee has devoted much time to legislation to prevent the spread of the cotton boll weevil (*Anthonomus grandis*) into the British West Indies. This weevil was introduced long ago from the American mainland into Cuba, and in 1933 it was discovered in Haiti. It has become extremely destructive there, and its further spread into the Lesser Antilles might put an end to the commercial production of cotton in these islands."

66. THE IMPERIAL COLLEGE OF TROPICAL AGRICULTURE, TRINIDAD. The Report for 1938-39 is the first compiled by Mr. O. T. Faulkner, C.M.G., as Principal, and records progress during the period under review. The most important research work is still centred round the main crops of the island—sugar-cane, cacao, and bananas—and summaries are included of the investigations carried out by the Departments of Agriculture, Botany, Chemistry and Soil Science, Economics, Entomology, Mycology, and Sugar Technology. The number of students in residence was 65. During the year 16 Associateships and 12 Diplomas were awarded. Forty-two scientific papers were published, including those written for *Tropical Agriculture*. The following additions were made to the Library: parts of periodicals, 14,830; pamphlets, 2,552; books (purchased), 225; books (presented), 53.

67. ANTIGUA: COTTON INDUSTRY, 1937-39. (*Rpt. of Agr. Dpt. Antigua*, 1938.) The 1937-38 crop of 175,000 lb. of lint was reaped from some 1,600 acres; 76 per cent. of the crop was peasant grown. Clean lint sold at from 1s. 3d. to 1s. $6\frac{1}{2}$ d. per lb. Peasants' cotton was again purchased by the Antigua Cotton Association. Two ginneries—the Antigua Cotton Factory and the Osborne Ginnery—operated during the season. The method adopted in recent years for providing pure seed for planting was continued, the pedigree seed being obtained from Montserrat as before. To control pink bollworm, the close season was extended from May 1 to August 15 inclusive—an increase of one month over the usual period—and the planting season was limited to six weeks; strenuous efforts were also made to eradicate wild cotton. The area planted for the 1938-39 crop was estimated at 2,000 acres, and prospects were good at the end of December. A noteworthy feature was the reduction in the prevalence of pink bollworm following the $3\frac{1}{2}$ months' close season. The cotton caterpillar (*Alabama argillacea*) damaged cotton in some areas, and the use of lead arsenate instead of Paris green proved more effective as a control.

68. BARBADOS: COTTON INDUSTRY, 1938-39. (*Agr. Jour., Dpt. of Sci. and Agr., Barbados*, viii., 2, 1939.) Only 77 acres of cotton were grown commercially. No precautions were taken to prevent injury by the cotton leaf defoliator (*Alabama argillacea*), and this factor coupled with an excessive November rainfall resulted in very poor yields. Pink bollworm damage was small, and it would appear that the enforced close season from March, 1937, to September, 1938, had a beneficial effect. Progeny row and bulking plots and a variety trial were grown by the Department of Agriculture, but on account of excessive rains yields from these were poor. To secure the introduction of only healthy material into the island imported cotton seed was disinfected by means of the Simon's Heater and the holds of thirteen ships were fumigated with Zyklon B.

69. MANURIAL TRIAL WITH SEA ISLAND COTTON. By S. J. Saint. (*Agr. Jour., Dpt. of Sci. and Agr., Barbados*, viii., 1, 1939.) Cotton being customarily grown in Barbados as a catch crop on heavily manured sugar-cane land, it is not regarded as requiring special manures. The investigation recorded in this paper was made to test the validity of this assumption. Although the no-manure plot gave an exceptionally good yield (1,280 lb. seed cotton per acre), an application at the rate of 2 cwt. of sulphate of ammonia per acre gave a 28 per cent. increase. Neither potash nor potash plus phosphates in addition to the nitrogen gave a significant result.

70. COTTON GROWING AND COTTON PESTS CONTROL. By R. W. E. Tucker. (*Agr. Jour., Dpt. of Sci. and Agr., Barbados*, viii., 1, 1939.) Before the arrival and spread of pink bollworm in Barbados Sea Island cotton was usually planted in June and often left to grow until the land was required for sugar-cane in the following year. This period might extend to eleven months, and if the first crop happened to be poor compensation frequently followed from later flushings. This free-and-easy method suited such planters as took interest in the crop.

The advent of pink bollworm gave rise to legislative regulation. Planting is confined to a period of three weeks around the beginning of September, and fields have to be cleared by the end of April, when the four months' close season begins. This arrangement has the disadvantage of making cotton picking coincident with the cane reaping season. In spite of the inducements of ginning facilities, seed control, and readily available advice, the restriction imposed and the inconveniences in relation to the cycle of the dominant crop have caused a decline in the willingness of planters and smallholders to plant the crop.

It is the author's purpose to argue that under the regulations cotton can still be grown profitably at present prices, and that success depends mainly on efficient pest control, which so far as the grower is individually concerned means the substitution of a regular schedule of lead arsenate spraying for the practice of *ad hoc* dusting with Paris green to control the defoliating caterpillars of *Alabama argillacea*.

71. GRENADA: COTTON INDUSTRY, 1938. (*Ann. Rpt. of Agr. Dpt., 1938.*) Cotton of the mixed West Indian type known locally as Marie Galante is grown on the dependent island of Carriacou. Special consideration was given during the year to the condition of this industry, with assistance from the advice of Mr. J. B. Hutchinson. Grading based on the percentage of Barbadosense and Bourbon in the mixture is proposed. The higher ginning percentage of Barbadosense more than compensates for somewhat lower value of lint. New Barbadosense types have been introduced for trial.

72. MONTSERRAT: COTTON INDUSTRY, 1936-38. (*Rpt. of Agr. Dpt. Montserrat for 1936, 1937 and 1938, received December, 1939.*) The dominant position held by cotton in the domestic exports of the island is shown by the following figures, which represent in thousands of pounds the proportion of cotton to total

export values, 1934-38: $\frac{36}{46}$, $\frac{52}{72}$, $\frac{38}{48}$, $\frac{47}{61}$, $\frac{27}{38}$. Lime products and tomatoes account for a great part of the remainder. The average yield of lint per acre in the three years under review was 101, 151, and 122 respectively, compared with 219, 283, and 229 in 1933-35. Fluctuations in yield of cotton are largely dependent on the weather, which is highly variable from year to year. To the perennial dispute between the advocates of late and early planting in the first half of the year there is now added a third party, recommending, primarily with a view to pink bollworm control, a revolutionary change to September-October. The figures for 1938 show that 2,487 peasants cultivated cotton on 1,895 acres of freehold or rented land; 1,509 acres were worked on the share system, while 1,049 acres were occupied by estate production. The breeding, multiplication and control of cotton seed is carried out by the Department under a system which ensures that no commercial cotton is derived from seed more than three generations from self-fertilization. Recently arrangements have been made for the regular supply of nucleus stocks of pedigree seed to the rest of the Leeward Islands.

73. ST. KITTS, NEVIS, AND ANGUILLA: COTTON INDUSTRY, 1937-39. (*Ann. Rpt. of Dpt. of Agr., St. Kitts-Nevis*, 1938, recently received.) The drought in the early part of 1937 caused a serious setback to the St. Kitts cotton crop, but with rains in June cotton made a remarkable recovery and a good crop was harvested. The cotton leaf worm (*Alabama argillacea*) was troublesome in certain districts, but little injury was caused by pink bollworm. The percentage of stained cotton was high. Early in the harvesting season the largest ginnery on the island was destroyed by fire, and some estates with limited storage space found it difficult to deal satisfactorily with the crop. Cotton in the 1937-38 season in Nevis benefited by the very dry weather from January to March, as conditions were unfavourable for rapid multiplication of pink bollworm. Production amounted to 210,872 lb. of lint. Purchasing of the peasants' cotton was again undertaken by the Government on similar terms as in the past. An advance of 4d. per lb. was made on clean seed cotton received at the ginnery, and the total amount paid by Government to the growers was £13,927 9s. 9d. The cotton was shipped to the British Cotton Growing Association. The 1938-39 cotton acreage was planted (as in St. Kitts and Antigua) with seed of the Montserrat type. The seed germinated well and the crop made rapid growth, but later the cotton leaf worm became troublesome. In Anguilla the weather in the 1937-38 season was unfavourable to the crop, the yield being 23,309 lb. of lint. The cotton was purchased from the peasants at the central ginnery at 3d. per lb. for clean seed cotton, with a promise of a bonus when all the cotton was sold in England. Planting of the 1938-39 crop started on August 2. A good deal of supplying was done before the peasant lands were fully established, owing chiefly to attacks of cutworms and to unfavourable weather. The Central Ginnery again supplied the growers with hand-picked seed.

COTTON IN THE UNITED STATES.

74. COTTON PRODUCTION IN U.S.A. By S. B. Hunt. (*Cotton, U.S.A.*, 103, 9, 1939, p. 50. From *Summ. of Curr. Lit.*, xix., 22, 1939, p. 630.) Tables and charts are given to show the percentage of cotton production for selected periods to the east and to the west of the Mississippi River. The eastern cotton producers had only about 38 per cent. of the total cotton acreage during the nine-year period ending 1938, yet they produced 44 per cent. of the total cotton. Factors responsible for this substantial difference are: (1) The "snapping and sledging" method of harvesting cotton in Texas tends to reduce yield; (2) the eastern grower uses more fertilizer per acre than the western grower; and (3) there is more intensive cultivation in the east.

75. AMERICAN COTTON CROP, 1938-39. By H. Plauche. (*Cotton*, M/c, **45**, 2184, p. 9, 1939. From *Summ. of Curr. Lit.*, xix., **22**, 1939, p. 630.) Production, consumption, carry-over, supply and distribution, export and other figures relating to the American cotton crop, 1938-39, are given, and the characteristic features of the season are reviewed. The commercial crop of the United States for the 1938-39 season amounted to 10,758,855 bales, compared with 13,562,070 bales in 1937-38. In grade the crop averaged better than middling, the staple being slightly better than in the previous season. The carry-over amounted to 13,438,000 bales, of which 12,326,000 bales were in the United States and only 1,112,000 bales in foreign countries. World consumption of American lint cotton amounted to 11,086,000 bales, compared with 11,177,000 bales in 1937-38. Of this amount 6,579,000 bales were consumed in the United States, foreign spinners using only 4,327,000 bales. Exports of American cotton amounted to 3,414,394 bales, the lowest export figure since 1881-82.

76. RAW COTTON: CONSUMPTION, U.S.A. (*Rayon Organon*, **11**, 1940, p. 28. From *Summ. of Curr. Lit.*, xx., **5**, 1940, p. 120.) Figures for the American lint cotton consumption are tabulated month by month from 1913 to 1939. The total for 1939 was 7,371,420 bales.

77. AMERICAN COTTON BALES: IMPROVEMENT. By J. von Csiky. (*Textilberichte*, 1939, **20**, p. 328. From *Summ. of Curr. Lit.*, xix., **13**, 1939, p. 378.) Figures showing the decline in consumption of American cotton and increase in the consumption of other growths are quoted, and two new methods are discussed. These are the cultivation of cotton in one-variety communities and the use of cotton bagging. A special marketing plan for selected bales from one-variety communities has been introduced. Subsidies are being provided. The advantages of cotton bagging are described and data are given showing the savings in costs of the bagging material and in freight compared with jute bagging. The use of cotton ropes instead of iron bands is also being tried. The chief handicap to the use of cotton bagging arises from the practice of buying cotton bales on a gross weight basis. American mills have agreed to make suitable allowances to the farmer for the lighter weight of cotton bagging.

78. AMERICAN COTTON FUTURES CONTRACT. (*Cotton*, M/c, 1939, **45**, 2174, p. 10. From *Summ. of Curr. Lit.*, xix., **17**, 1939, p. 471.) Particulars are given of approved changes in the American Futures Contract which will replace the old contract in July, 1940. Dealings have already begun, and the first trading position in the new contract will be October, 1939. The basis is Middling $\frac{1}{8}$ inch cotton instead of $\frac{7}{8}$ inch, and provision is made for $\frac{2}{32}$ inch and $\frac{3}{32}$ inch staples. High-density bales are put on the same basis as "standard density." Staples above $\frac{1}{8}$ to 1 inch are deliverable at 75 per cent. of the commercial premiums over $\frac{1}{8}$ inch. Cotton not rain-grown is admitted to the contract, but only in grades Middling and above and in staples of $1\frac{1}{2}$ inches or longer.

79. AMERICAN COTTON GINNING: IMPROVEMENT. By C. K. Cobb. (*Cotton*, U.S., **103**, 6, 1939, p. 56. From *J. Text. Inst.*, xxx., **10**, 1939, A611.) References to ginning in the descriptions of the nine official grades of American cotton are extracted, and the need for better ginning, especially of the longer cottons, is emphasized. The author considers that most of the gins of North Georgia are twenty-five years old. Modern gins have equipment for drying and cleaning the cotton.

80. AMERICAN SPINNING MILL: MODERNIZATION. By R. W. Philip. (*Cotton*, U.S., **103**, 8, 1939, p. 65. From *J. Text. Inst.*, xxx., **12**, 1939, A761.) A description is given, with illustrations, of the installation of new Saco-Lowell spinning frames by the Dallas Manufacturing Co., U.S.A. The novel feature is the use of sleeve spindles with impregnated paper tubes instead of the usual tapered steel spindle blade and wooden warp bobbin. With $2\frac{1}{4}$ -inch rings the

frame produces 5 oz. of yarn per bobbin. Other features are anti-friction bearings and ball-bearing, cork-covered front top rollers.

81. MARKETING PRACTICES IN PRODUCERS' LOCAL COTTON MARKETS. By J. W. Wright. (*U.S. Dpt. Agr., Bur. Agr. Econ.*, 1938. From *Exp. Sta. Rec.*, **81**, 1, 1939, p. 438.) This preliminary report, based on data collected by the survey method in 101 markets throughout the Cotton Belt at the end of 1935-36 marketing season, describes the problems of marketing cotton, the marketing practices of growers and first buyers, and makes an appraisal of the possibility of solving the present problems by adjustments in marketing procedures.

82. A REVIEW OF THE TEXTILE TRADE OF THE UNITED STATES OF AMERICA. By W. A. Grierson. (*Text. Wkly.*, 5/1/40, p. 6.) An address given to the British Association of Managers of Textile Works in December last, after a visit to the United States principally to study marketing conditions and methods. The author states that "the specialized cotton spinning mills are very similar to our own mills, producing yarn for sale on the open market, but the mills are smaller than in Lancashire—200 average not more than 20,000 spindles, and most of these are in single-storey buildings. There are very few mule spindles. Many of the small ring spinning mills specialize on one count of yarn from one grade of cotton, and everywhere very long runs without changes are the rule. Of the 180 specialized weaving mills which buy their own yarn and sell their grey cloth in the open market, the average number of looms is 100 in each mill, making a total of 17,000 looms. These small plants standardize their fabrics as far as possible, and endeavour to obtain long runs on a standard cloth. In the combined mills group the plants are larger. In this group there are 24,000,000 spindles and 570,000 looms, but only ten mills in New England have more than 200,000 spindles. Taking the industry as a whole, in 1926 there were 38,000,000 spindles, and in 1936, 29,000,000 spindles, showing that the industry in the United States had suffered in the post-war period in the same manner as Lancashire. The production of cotton fabrics in the United States reaches 8,000,000,000 yards per annum. In 1938 America imported from the United Kingdom about 12,000,000 yards, which equals less than one-fifth of 1 per cent. of the home production."

83. CHANGES IN TECHNOLOGY AND LABOUR REQUIREMENTS IN CROP PRODUCTION. COTTON. By W. C. Holley and L. E. Arnold. (*Works Prog. Admin.*, Philadelphia, U.S.A., Rpt. A-7, 1938. From *Exp. Sta. Rec.*, **81**, 3, 1939, p. 432.) This report is limited to the trends in the amount of labour used in producing the cotton crop in U.S.A. and the effects of technological changes on these trends. The trends in acreage, yield and production, and in tenure groups of producers, the recent changes in operations and amounts of labour used, mechanization in cotton production, influence of improved varieties of cotton, the development in cultural practices, and cotton diseases and insects, are discussed. Appendices include tables showing the acreage yield, and production, 1900-36; average staple length and percentages of cotton tenderable 1928-36; tons of fertilizers consumed 1909-35; average yearly amounts of labour used by States 1907-11, 1917-21, 1927-31, and 1933-36; and abstracts of data from secondary sources on labour on cotton.

84. SOCIAL STATUS AND FARM TENURE: ATTITUDES AND SOCIAL CONDITIONS OF CORN BELT AND COTTON BELT FARMERS. By E. A. Schuler. (*U.S. Dpt. Agr. Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt. 4*, 1938. From *Exp. Sta. Rec.*, **80**, 6, 1939, p. 843.) This preliminary report is a study in social psychology along novel lines, dealing with the attitudes, opinions, and aspirations of families in the two regions whose economic and social status is to a considerable extent predicated upon their land-tenure status. Successive

chapters deal with region and race, attitudes and opinions, the agricultural ladder and its operation, landlord-tenant relationships, moves and migration, group life in the country, and levels and standards of living.

85. FIELD CROPS RESEARCH IN THE BUREAU OF PLANT INDUSTRY, U.S.A. (*U.S. Dpt. of Agr., Bur. of Pl. Indus. Rpt.*, 1938. From *Exp. Sta. Rec.*, **80**, 6, 1939, p. 755.) Includes reports on the following in connection with cotton: Breeding work and fertilizer experiments; studies of the influence of variety and growth conditions on spinning value; development of fibres and their deterioration by micro-organisms; association of plant alkaloids with resistance to root rot; and advantages of one-variety communities.

86. SEED COTTON: MARKETING IN U.S.A. By L. D. Howell. (*U.S. Dpt. Agr. Tech. Bull. No. 662*, 1938. From *Summ. of Curr. Lit.*, xx., **2**, 1940, p. 22.) A substantial proportion of the cotton produced in some parts (especially the north) of the Cotton Belt, and in other countries, is sold before ginning. The author has studied (1) the extent of this practice, (2) the differences in the returns to the grower between selling seed cotton and the usual ginned cotton, and the other advantages or disadvantages of the practice to growers and to ginners. Tables of data relate to the size, grade, staple and prices of cottons on selected local markets in Oklahoma, Missouri and Tennessee, during the seasons 1928-29 to 1932-33. The grower reaped a price advantage when selling longer staples and lower grades, could dispose of miscellaneous weights of cotton, and avoided delays at the ginnery. The ginner had the advantage of extending his season and allowing wet cotton to dry, but ran the risk of differences in lint percentage and of price fluctuations. The main objection to selling cotton in the seed is that it encourages growers to aim at yield of seed cotton per acre rather than high lint index and quality, and also offers him an advantage in selling wet and dirty cotton.

87. FIELD CROP EXPERIMENTS IN ARKANSAS, 1938. (*Arkansas Sta. Bull.* 368, 1938. From *Exp. Sta. Rec.*, **80**, 6, 1939, p. 755.) Cotton investigations included histological and cytological studies, environmental and yield relationships, effects of alternating drought with adequate supply of water on length of lint, nutritional studies, influence of the level of nitrogen supply to the plant on oil, protein, and gossypol content of cotton seed, and measurement of fibres of varieties of cotton.

88. FIELD CROP RESEARCH AT THE GEORGIA COASTAL PLAIN STATION, 1937. (*Ga. Coastal Plain Sta. Bull.* 29, 1938. From *Exp. Sta. Rec.*, **81**, 3, 1939, p. 362.) The work on cotton included varietal tests, breeding work, fertilizer experiments and fertilizer placement studies.

89. BIENNIAL REPORT OF THE NORTH-EAST LOUISIANA EXPERIMENT STATION, ST. JOSEPH, LOUISIANA, 1937-38. By C. B. Haddon. (*Exp. Sta. Rec.*, **81**, 3, 1939, p. 363.) Continued experiments with cotton included fertilizer experiments, comprising carriers of nitrogen and potassium, and rates of sodium nitrate, mixed fertilizers, production after different legume winter cover crops and after vetch seeded at different rates and turned under on several dates; yields following corn and soybeans, and after nitrogen carriers as supplements to vetch; spacing and varietal tests with cotton.

90. QUALITY OF NORTH CAROLINA COTTON, 1928-36. By W. B. Lanham *et al.* (*N. Car. Sta. Bull.* 323, 1939. From *Exp. Sta. Rec.*, **81**, 5, 1939, p. 722.) During the period the average staple length of cotton produced in the State increased from 14.69 sixteenths of an inch to 16.07 sixteenths, as compared with 15.18 sixteenths of an inch to 15.77 sixteenths for the United States. In 1936 13 per cent. of the cotton in the State had a staple length of less than $\frac{1}{16}$ inch and 85 per cent. $\frac{1}{16}$ inch to $1\frac{1}{16}$ inches, as compared with 80 and 19 per cent. respectively in 1928. Little or no progress was made in improving grades.

COTTON IN EGYPT.

91. REVIEW OF THE 1938-39 COTTON SEASON. By C. R. Barber. (*Egyptian Cott. Yearbk.*, 1938-39, p. 13.) The local statistical position at the end of the season was a great deal more favourable than had seemed probable six months earlier. At the end of February exports were nearly a million kantars below the corresponding 1937-38 figure, but thanks to unexpectedly heavy spring and summer shipments much of the leeway was afterwards made up, and the total 1938-39 exports of 8,483,847 kantars proved less than half a million kantars smaller than the 1937-38 record. Local consumption set a new record at 569,623 kantars, and the lint carry-over on August 31 was only 720,000 kantars, compared with 1,485,000 kantars on August 31, 1938.

92. ECONOMIC CONDITIONS. (Dept. of Overseas Trade, H.M. Sta. Off., 2s. 2d., post free. From *Text. Manufr.*, lxvi., 781, 1940, p. 17.) New measures of taxation have been enacted, and have helped to ease heavy Governmental expenditure while the world market price of cotton, Egypt's main export, has been falling. A budget deficit of over £E1,500,000 is estimated for 1939-40, and now, of course, will be overshadowed by war expenditure. For the first time since 1932 Egypt experienced an adverse balance of visible trade. The United Kingdom remains both Egypt's best customer and supplier, and a fall in exports from this country is noticeable, competition in cheap varieties being particularly severe. Cotton still accounts for three-quarters of all Egypt's exports, and the prices of cotton have been comparatively low. Total imports of cotton piece-goods have declined, the United Kingdom share being adversely affected. Despite new duties there is strong competition from Italy, through manufacturers offering quotations considerably below any other European producers. Competition from India is intense, chiefly in cheap grey and bleached goods.

93. THE COTTONS OF EGYPT. By H. A. Hancock. (*J. Text. Inst.*, xxx., 10, 1939, p. 412.) Recent trends in the Egyptian crop with regard to staple length, yield, grade, and uniformity of staple are indicated and discussed. Staple characters, quantities of cotton available, yarn strength and counts spinnable are tabulated for the several varieties and grades, and are also discussed from the spinner's point of view. The chief control measures adopted by the Egyptian Government for improvement of the crop are briefly reviewed under the headings: Seed Control and Renewal; Prohibition of Mixing of Varieties; Introduction of New Varieties; Measures for Combating Pests. In an appendix, section 1 deals with the Humidity Agreement for Egyptian cotton, section 2 with sources of statistics of Egyptian cotton, and section 3 contains a selection of official Technical and Scientific Service Bulletins, 1929-39.

94. EGYPTIAN COTTON VARIETIES. (*Man. Guar.*, 14/2/40.) The Egyptian Ministry of Agriculture has agreed with the Alexandria exporters to give names to its new cotton varieties instead of the Giza numbers by which they are at present known. With the recent introduction of several new Giza types it was felt that confusion might be caused both to growers and spinners. The main new variety, Giza 7, will keep its present name. The high-yielding medium-staple variety, Giza 12, is to be called Wafeer, an Arabic word meaning "abundance." For the two new long-staple varieties, Giza 26 and Giza 29, the names Malaki and Karnak are proposed. Malaki is the Arabic word for "royal," and was thought suitable for a variety which is now generally recognized to be superior in staple to any Egyptian cotton previously grown. Giza 29 is expected to be a very well known and popularly used long-staple type in future, and the word Karnak will carry associations with Egypt for all those who have visited the temples near Luxor. It should not, of course, be assumed from this name that this variety will be grown in the Luxor

district. Selections still under trial will continue to be Giza numbers, as at present, until it is sufficiently established that they are likely to be popular marketable cottons. The Egyptian Government believes that its continued success in the development of desirable new types will be a big factor in the future economic development of Egypt.

95. EGYPTIAN COTTON VARIETIES. By C. H. Brown. (*Egyptian Cott. Yearbk.*, 1938-39, p. 45.) A discussion of the selection work carried out by the Botanical Section at Giza. Two very promising strains are Giza 29 and Giza 36.

96. WHITE EGYPTIAN COTTON: PRODUCTION. By Fouad Abaza Pasha. (*Cotton*, M/c, **45**, No. 2184, 1939, p. 18. From *Summ. of Curr. Lit.*, xix., **22**, 1939, p. 629.) About two years ago the Royal Agricultural Society of Egypt put on the market a new variety of cotton called "Bahtim Abiad"—i.e., Bahtim White—which is almost equal in whiteness to Peruvian Tanguis, but is finer, longer and stronger than Tanguis. It is classed among the medium staples of Egypt—i.e., in the same category as Giza 7—and it now sells on Giza 7 contracts at a premium slightly below that of Giza 7. An important feature of this cotton is its remarkable earliness. The plant is a small tree with good fruiting nature, and responds well to nitrogenous fertilizers, but is susceptible to wilt. Attempts are being made to strengthen resistance to wilt by selection and hybridization, and crossing is also being utilized to introduce additional improvements in staple characteristics. New strains of Bahtim Abiad of improved resistance to disease have been produced, and a number of new strains of white cotton of different shades of whiteness, still in the experimental stage, are giving encouraging results.

97. EGYPTIAN TEXTILES: HISTORY. By J. Gallotti. (*Ciba Rev.*, **21**, 1939, p. 734. From *J. Text. Inst.*, xxx., **8**, 1939, A516.) A brief illustrated history of weaving in Egypt is sketched during (1) the time of the Pharaohs, 3400 to 332 B.C.; (2) the Hellenistic and Coptic period, 332 B.C. to 640 A.D.; and (3) Egypt under Islam, from A.D. 640.

98. THE EGYPTIAN COTTON YEARBOOK, 1938-39. (Pubd. at P.O. Box 612, Alexandria, Egypt; also obtainable from Mr. Dudley Windel, 15, Tithebarn St., Liverpool. Price: Egypt, P.T. 50; other countries [including postage], 10s.) We have received a copy of the eighth edition of this publication, which contains numerous tables of statistics of acreage, production, stocks, prices, consumption, exports, etc., and two articles, "Review of the 1938-39 Cotton Season" (C. R. Barber) and "Egyptian Cotton Varieties" (C. H. Brown).

99. THE QUANTITY, DISTRIBUTION AND COMPOSITION OF THE ORGANIC MATTER AND AVAILABLE NITROGEN IN EGYPTIAN SOILS. By D. S. Gracie and F. Khalil. (*Tech. and Sci. Serv. Bull. No. 222*. Min. of Agr., Egypt, 1939.) The aim of this Bulletin is to attempt to provide the essential background against which the rational discussion of problems of nitrogenous manuring of agricultural crops in Egypt should take place. The contents are divided into three main sections. The first is devoted to a characterization of the quantity, composition and distribution of organic matter in fertile perennially-irrigated Egyptian soils, the second to a description of investigations into the mechanism of transformation of the various forms of nitrogen, and the third section to a short account of the progress so far made in applying the results to the definition of the manurial requirements of the various crops.

The discussion largely centres round the beneficial effects of the long period of drying of irrigated soils in the summer months. Previous workers have postulated the partial destruction by heat of a harmful factor limiting bacterial activity. The facts presented lead to the much simpler conclusion that the effects are due to an increase of the amounts of easily decomposable (and highly nitrogenous) organic matter in the soils. The benefit is temporary and may

largely be lost if the soil is irrigated too soon before planting. No adequate picture of the organic-matter status can be presented without taking into consideration the conditions in successive layers down to the depth of at least one metre. The C/N ratio is of fundamental importance, as it determines the course of events when the soil organic matter is undergoing decomposition by bacteria.

Success was obtained in correlating wheat yields with estimates of available nitrogen made at sowing time, but none so far with cotton. In the latter case other factors may be dominant or the methods applied imperfect.

[Cf. Abstrs. 54, Vol. VII.; 211, XII.; 25, 79, XIII.; 79, XIV. of this Review.]

COTTON IN OTHER FOREIGN COUNTRIES.

100. ARGENTINA: COTTON CROP, 1938-39. (*Text. Wkly.*, 12/1/40, p. 51.) The crop was the second largest on record, amounting to 326,959 bales of 478 lb. Cotton was planted on 1,004,956 acres, and 840,750 acres were harvested—the largest area yet to be harvested. The yield of 186 lb. to the acre was lower than the 234 lb. obtained in 1935-36, when the record crop was produced.

101. BELGIAN TEXTILE INDUSTRY: DISTRIBUTION AND MAGNITUDE. By J. Bertrand. (*Times Trade and Eng., Belgium Supplmt.*, June, 1939. From *Summ. of Curr. Lit.*, xix., 14, 1939, p. 430.) Belgium has 53 cotton spinning mills with 1,984,000 spinning and 360,000 doubling spindles. La Textile Société Co-operative controls 1,300,000 spindles. Only one mill spins as fine as 80's. There are about 40,000 cotton looms and a wide range of cloth is manufactured. In the wool industries there are 550,000 spindles on worsted and 376,000 on woollen yarns, and also more than 7,500 looms. Flax spindles amount to 250,000 in 13 mills, and linen is woven in about 100 mills. There are 25 jute mills operating about 72,000 spindles and 3,000 looms, and 40 hemp-spinning mills. The rayon factories produced in 1938 5,800,000 kg. of viscose, acetate and staple fibre yarns. Special reference is made to the importance of the carpet and clothing industries.

102. BELGIAN CONGO: RAPPORT ANNUEL DE L'INÉAC POUR L'EXERCICE 1938. Pt. I. (Obtainable: INEAC, 14, rue aux Laines, Brussels. Price, 35 fr.) Indicates the wide range of agronomic investigation carried out in the Belgian Congo. Summaries are given of the work of six scientific divisions occupied with general subjects and four with the agronomy of special crops, and of the activities of the numerous experimental plantations and district stations.

The two principal cotton stations are Bambesa in the north-east approaching the Sudan, and Gandajika between lat. 6° and 7° S. Both stations are occupied with selection, cultural experimentation, and phytopathology. At Bambesa a locally selected family 145 is regarded as superior to U./4/4/2 from Barberton, S.G.23 from Uganda, and a number of American varieties with which it has been compared. At Gandajika, out of a large number of lines carried in the collection, a family originating in a natural hybrid of Triumph and U.4 is regarded as promising.

Of more than local interest is the experimentation in the use of elephant grass as a soil regenerator either alone or planted with other grasses or with leguminous cover crops. Elephant grass planted very close, and cut at three-monthly intervals to supply material for compost or mulch, is regarded as providing an efficient means for the preservation of the fertility of native farms.

Studies are being continued in varietal resistance to stigmatomycosis, for which purpose the physiology of the boll is under investigation. Trouble is being experienced with *Fusarium* wilt. Research is proceeding on several parasites of *Dysdercus*, and satisfactory results are reported with petroleum

emulsion sprays. At the southern station severe losses are caused by internal boll disease and mummification due to bug punctures.

103. LES RESULTATS DE LA SÉLECTION COTONNIÈRE. (*Agr. Élev. Congo Belge*, **13**, 1939, p. 139. From *Pl. Bre. Absts.*, x., **1**, 1940, p. 43.) The new pedigree cottons (in Belgian Congo) have proved superior in staple length, and the most promising lines are mentioned. Of these, 145 C.55 and 145 C. are superior in yield, which more than counterbalances a slight deficiency in ginning percentage.

104. L'AMÉLIORATION DES PLANTES AU CONGO BELGE. By - Govaert. (*Rapp. Comm. Sect. Résumés*, 8th Cong. Int. Agr. Trop. Subtrop., Rome, 1939. From *Pl. Bre. Absts.*, ix., **4**, 1939, p. 399.) The new cotton selection 145 C.55 has surpassed the standard in yield by 42.5 per cent. and is very popular with the trade.

[Cf. previous abstract and Abstr. **713**, Vol. XVI. of this Review.]

105. BRAZILIAN COTTON INDUSTRY. By W. G. Ashmore. (*Text. World*, **89**, **13**, 1939, p. 44. From *Summ. of Curr. Lit.*, xx., **3**, 1940, p. 67.) There are over 500 textile mills of all kinds in Brazil. Of these, about 350 mills, with 2,750,000 spindles and 85,000 looms, manufacture cotton goods. Many of the mills are small and unimportant, but a few are as modern and efficient as any in the United States. It is estimated that 70 per cent. of the equipment in Brazil is obsolete, but in spite of this, and in spite of poor management, many mills show earnings four to five times as great as the best mills in the United States. There is a great margin of profit between manufacturing costs and selling price of goods. Labour is as cheap as in Japan, overhead costs are extremely low. Many mills sell directly to the retailer. There is an ample domestic supply of cheap raw cotton and wool, and some rayon and silk are produced locally at low cost. During the past year, however, the Brazilian cotton industry underwent a "crisis" due to under-consumption. The industry is hampered by Government regulations and restrictions which are often changed several times a year. The average Brazilian worker runs 25 per cent. of the equipment run by a worker in the United States. Brazil produces all the cheaper grades of cotton cloth for domestic consumption and exports a small amount to other Latin-American countries. Domestic production is protected by a high tariff wall, and relatively few textiles except fine yarns and quality products are imported. Production of raw cotton in Brazil increased from 500,000 bales in 1932 to 2,000,000 bales in 1938. Well over half the crop is of good grade and staple and compares favourably with similar types of North American cotton. Experiments at the São Paulo State Agricultural Experiment Station have resulted in adaptations of the Texas Big Boll and Express varieties, which average $1\frac{1}{10}$ inches. The Government maintains a strict control of seed and planting. The grading of the Federal Grading Commission has a reputation for accuracy and honesty. The Brazilian industry consumes 600,000 to 700,000 bales annually. Germany, Japan and Italy took 63 per cent. of the export surplus in 1938.

106. THE COTTON INDUSTRY IN CHINA. By S. Kawaguchi. (*Text. Wkly.*, **34**, pp. 480 and 508.) A survey of the condition of the Chinese cotton industry before the war with Japan, the changes in the productive capacity after July, 1937, the shift in ownership of equipment and its significance, present conditions in the marketing of products and supply of materials, and the future prospects of the industry. Before the war the Chinese cotton industry was expanding rapidly, but since the outbreak of hostilities total equipment, including that under construction, has been reduced from 6,066,000 spindles and 79,200 looms to 4,137,000 spindles and 48,300 looms, a decline of 32 per cent. and 39 per cent. respectively. Up to May, 1939, the import of raw cotton at Shanghai was free, and the industry in Central China prospered, but in the north the scarcity of

raw cotton caused factories to operate at only 75 per cent. of their capacity. Since June, however, raw cotton supplies have been scarce in Shanghai, and spinning mills have had to restrict operations to about 50 per cent. of capacity. Notwithstanding the seriousness of the position the author is of opinion that rapid progress will once again be made as soon as political and economic conditions in East Asia are stabilized.

107. HOPEI COTTON IMPROVEMENT AND THE FUTURE OF THE STONEVILLE No. 4. By Y. S. Chen. (*Agr. Sci.*, Peking, June, 1939. From *Pl. Bre. Absts.*, x., 1, 1940, p. 42.) Regional variety tests have shown that Stoneville No. 4 is the best American cotton for the provinces of North China south of Peking. Breeding work has been carried on by the Hopei Cotton Improvement Institute to remedy the defects of this variety such as its susceptibility to diseases and lateness in the northern part of Hopei. Most of the work has been destroyed in the Sino-Japanese war, but the remaining material has been preserved and more selections and crosses have been made.

108. MANCHOUKUO COTTON INDUSTRY CONTROLLED. (*Int. Cott. Bull.*, xvii., 68, 1939, p. 485.) The annual demand for cotton in Manchoukuo is 650,000,000 square yards. The bulk of the cotton yarn was formerly imported from Japan and domestic production was small, but since the China incident began Japan has restricted the exportation of cotton piecegoods to Manchoukuo, and Manchoukuo itself has begun importing raw cotton. In consequence, the country's demand for cotton goods has not been fulfilled satisfactorily, and prices have risen considerably. The Manchoukuo Government recently applied strict control over the cotton industry with a view to achieving self-sufficiency. The spinning companies are no longer allowed to purchase raw cotton at will. They are unable to make as much profit as formerly, although the margin is about 15 per cent., which is not extremely low. A more difficult problem is the quantity of raw cotton to be distributed to the spinning companies. Some 470,000 spindles are in operation, for which 1,200,000 piculs of raw cotton will be required. Owing to exchange control neither American nor Indian cotton can be imported, and supplies must come from North China, but it is not believed that the required amount will be forthcoming. The Government is trying to relieve the situation by compelling spinning companies to mix 30 per cent. of staple fibre with the cotton, but it is feared this will have little effect, and the spinners may be compelled to reduce the number of spindles.

109. PERENNIAL COTTON IN SOUTH-WESTERN CHINA. By T. H. Shen. (*New Economist*, 1, 2, 1938, p. 48. From *Pl. Bre. Absts.*, ix., 3, 1939, p. 319.) Four distinct types of perennial cotton found by the author at Kaiyung, Yunnan Province, China, are described. All these types were superior to annual cottons in vigour, yield and quality. It is therefore suggested that in breeding new cottons for sub-tropical conditions in South-Western China, stress should be laid on developing perennial types of Egyptian, Sea Island and American Upland cottons rather than annual types.

110. VARIETY TRIALS CARRIED OUT BY THE GREEK COTTON INSTITUTE DURING THE YEARS 1932-37. By B. G. Christidis. (*Publ. Inst. Cott., Serv. Études Agron. Écon.*, Min. Agr., Athens, 1938. From *Pl. Bre. Absts.*, ix., 4, 1939, p. 438.) Variety trials involving American and Egyptian types are described. About sixty years ago, varieties of American Upland cotton were imported into Greece and have since been grown as a mixture. Considerable adaptation has occurred to the short season and droughty conditions of the country, and selection and inbreeding within this mixture has led to the production of valuable types.

Seed of strains self-fertilized for two years has been distributed to farmers. Stocks seld for a longer period are now being raised.

[Cf. Abstrs. 575, Vol. XII., and 666, Vol. XVI. of this Review.]

111. COTTON CULTIVATION IN ITALY. (*Boll. Coton.*, **34**, 1939, p. 437. From *Summ. of Curr. Lit.*, xix., **22**, 1939, p. 629.) The text is given of a decree regulating the cultivation, storing, ginning and sale of cotton in Italy. Photographs of cotton growing in Aprilia and in an experimental plot at Palermo, and photographs showing the preparation of standard samples of Sicilian cotton, are given.

112. JAPANESE INDUSTRIES: CHANGES SINCE 1929. By Y. Kamii. (*Text. Manufr.*, **65**, 1939, pp. 480-489. From *Summ. of Curr. Lit.*, xix., **24**, 1939, p. 724.) Industrial developments in Japan since 1929 have been characterized by rapid expansion and by a decline in the relative importance of the Japanese textile industry. Textile production was 39 per cent. of the total industrial production in 1929, but only 28 per cent. in 1936 owing to rapid developments in the iron and steel, engineering and chemical industries. Changes in the number and distribution of workers and in the duration of workers' employment in industry indicate an increase in the number of skilled workers and the establishment of an industrial working-class on a firmer and larger basis, and it is suggested that Japan may eventually have to face such modern industrial problems as an organized labour movement or large-scale unemployment. Since 1929 the Japanese cotton industry has turned to the production of finer qualities, and there have been considerable increases in the manufacture of textile machinery, rayon yarns, and dyes. Factory statistics reveal a growing mechanization of factories in Japan. The number of spindles per worker increased by 40 per cent. during the period 1929-37, and the production of yarn per worker rose by 34 per cent. In the cotton weaving industry, the number of looms per worker increased by 28 per cent. and the production of cotton fabrics per worker by 14 per cent.

113. NIGHT WORK IN JAPAN. (*Int. Cott. Bull.*, xvii., **67**, 1939, p. 388.) A report from the *Indian Textile Journal* is to the effect that Japanese textile industrialists are supporting a movement to revive night work by female operatives in the textile industry, particularly the cotton spinning and rayon production branches. Night work by female operatives in the textile industry in general has hitherto been prohibited by international agreement.

114. APUNTES SOBRE LA ORGANIZACION DE LA SECCION DE GENETICA DE ALGODON, DEL DEPARTAMENTO DE GENETICA VEGETAL, DE LA ESTACION EXPERIMENTAL AGRICOLA DE LA MOLINA. By T. B. Barducci. (*Min. de Fomento, Direcc. de Agr. y Ganaderia, Est. Exp. Agr.*, La Molina, Peru, November, 1939.) An account of the reorganization of cotton investigation in Peru on a wide basis of botanical and technical studies.

115. ASPECTOS GENETICOS DEL ALGODONERO EN PIURA (PERU). By B. T. Boza. (*Inf. Minist. Fom.* **48**, Lima, 1938. From *Pl. Bre. Absts.*, ix., **3**, 1939, p. 317.) Crosses have been made between *Gossypium hirsutum* L. (var. Acala) and *G. peruvianum* (var. Tanguis, cleistogamous form). Reference is made to two distinct types of Pima selected by Sr. Vega, one with erect habit and the other spreading; to a number of selections of Tanguis, including an early form; and to hybrids of Sakel \times Pima, obtained by Kearney, which seem well suited to the locality. A protest is made against the current practice of mixing varieties, an improved system of seed selection proposed by the author is outlined, and a list of the most pressing problems for cotton breeders is suggested. Collections are being made of the local cottons, *G. peruvianum*.

116. EL PROBLEMA DEL ALGODON. By B. T. Boza. (*Bol. Minst. Fom.* **14**, Lima, 1938. From *Pl. Bre. Absts.*, ix., **3**, 1939, p. 317.) In a lecture on local

cotton problems the speaker referred among other things to the merits of the variety Tanguis, to the fact that the organism to which it is resistant has now been shown to be *Verticillium* and not *Fusarium*, and to crosses that have now been made between Tanguis and Giza 7, which is also resistant to wilt.

117. COTTON GROWING IN THE PHILIPPINES. By A. Elayda and F. de Jesus. (*Phil. J. Agr.*, 9, 1, 1938. From *Exp. Sta. Rec.*, 81, 2, 1939, p. 205.) Practical information on varieties, soil and climatic needs, producing areas, cultural methods and field practices, production costs, and cotton insects and diseases and their control.

118. RUSSIAN COTTON INDUSTRY DEVELOPMENT. By P. Ruprecht. (*Klepzig's Textil-Z.*, 34, 1940, p. 101. From *Summ. of Curr. Lit.*, xx., 4, 1940, p. 91.) Developments in the Russian cotton industry and in the cultivation of cotton in Russia prescribed by the third five-year plan are briefly discussed. Production of cotton fabric is to be increased to reach 4.9 milliard metres in 1942, an increase of 40 per cent. on the 1937 production. For this purpose new factories and extensions to existing factories are being planned. Larger areas are being devoted to the cultivation of cotton in both Asiatic and European regions, irrigation systems are being put into operation, and new varieties of cotton giving higher yields are being developed. Production of raw cotton has increased from 1.12 million bales in 1928 to 3.8 million bales in 1937. Owing to bad weather the figure was lower in 1938, but the 1939 figure is expected to be higher. Cotton consumption in Russia amounted to 1.63 million bales in 1928 and 2.767 million bales in 1938. In 1936 Russia exported 31,550 bales, the exports going to America, Holland, France, England, Germany and Poland. About 560,000 bales were available for export in 1939. In that year Russia imported 77,000 bales, of which 66,616 bales were imported from Iran. Tadschikistan cotton is said to be superior in length and quality to the best Egyptian and American varieties.

119. COTTON CULTIVATION IN SIAM. By L. Jotisalikara. (*Ann. Rpt. Cott. Exp. Sta. Siam*, 1936-37, I. From *Summ. of Curr. Lit.*, xix., 17, 1939, p. 471.) The Siamese Department of Agriculture and Fisheries inaugurated a Cotton Experiment Station on new land in 1936 at Klongtan in the northern part of the country about 316 miles from Bangkok. The soil, climate, diseases and insect pests are briefly reported. Cambodia cotton seed (11,357 kilos) has been distributed to 919 growers. Variety, sowing date, spacing, pruning, breeding, and similar field trials are described. American varieties (Ferguson No. 406, New Boykin and Missdell No. 4A) show promise, but not Chinese, Indian or Egyptian varieties.

SOILS, SOIL EROSION, AND MANURES.

120. ROTHAMSTED EXPERIMENTAL STATION. In the Report for 1938, recently received, the work of the year in connection with grassland experiments, arable and vegetable crops, fertilizers, soils, pests and diseases, insecticides, etc., is discussed. The Library is steadily growing, and now contains upwards of 27,000 volumes on agriculture and cognate subjects. During the year 97 papers were published in various scientific journals, and summaries of 65 of them are included in the report. The report of the Woburn Experimental Farm is also included.

121. AN INTRODUCTION TO THE SCIENTIFIC STUDY OF THE SOIL. By N. M. Comber. (Ed. Arnold and Co., London, 1936, 3rd ed. From *Exp. Sta. Rec.*, 80, 4, 1939, p. 450.) The author has rewritten some parts of the chapters dealing with humus and with colloids and flocculation. A little has been added on the mineralogy of clay, and a paragraph on the randomized block method has been

appended to the chapter dealing with field experimentation. Some additions have been made to the treatment of water movement in soils.

122. SOIL CONSERVATION IN THE TROPICS. By Sir Frank Stockdale. (*Trop. Agr.*, xciii., 2, p. 93. Peradeniya, Ceylon. 1939.) Reprint of a paper read at the request of the organizers of the Conference on Tropical Agriculture, held at Wageningen, Holland, in December, 1938. A general survey of the subject, illustrated by experiences in the British tropical colonies.

123. ON THE FORMATION OF STRUCTURE IN SOIL. By D. I. Sideri. (*Soil Sci.*, 43, 1, 1937; 46, 2 and 4, 1938. From *Exp. Sta. Rec.*, 77, 1937, p. 305; 80, 1939, pp. 304 and 735.) A continuation of previous experiments. Pt. III. deals with the mechanism of the swelling of soil, Pt. IV. with the structure of mixed clay-sand and clay-humus formations, Pt. V. with granular structure, Pt. VI. with the method of microscopic investigation of soil structure in reflected light.

[Cf. Abstr. 86, Vol. XV. of this Review.]

124. WATER CONDITIONS OF THE SOIL AND IRRIGATION. By F. Menchikowsky. (*Hadar*, xii., 5, May, 1939. From *Trop. Agr.*, Ceylon, xciii., 4, 1939, p. 223.) A discussion of the following: The interrelationship of soil and water; rise of water in the soil and capillary moisture; types of moisture in the soil, and water requirement of the plant; constants of soil moisture and coefficients of plant growth; constants of soil moisture and moisture required by cultivated soil; the effect of mineral elements on the availability of soil moisture; accumulation of water in the soil; surface evaporation and conservation of soil moisture; the control of water relation in local soils and irrigation.

125. SOIL ORGANIC MATTER AND THE LIVING PLANT. By A. W. Blair and S. A. Waksman. (*New Jersey Sta. Bull.* 653, 1938. From *Exp. Sta. Rec.*, 80, 6, 1939, p. 738.) Presents a popular summary of the mode of formation, the nature, and the essential functions of the soil organic matter or humus, together with its maintenance and its relation to soil conservation.

126. A CRITICAL SURVEY OF INVESTIGATIONS ON THE "WILTING COEFFICIENT" OF SOILS. By J. V. Botelho da Costa. (*J. Agr. Sci.*, England, 28, 4, 1938, p. 630. From *Exp. Sta. Rec.*, 81, 2, 1939, p. 173.) In a review of contributions on this subject the author finds the original conclusions (1) that the wilting coefficient is independent of the kind of plant used as indicator and (2) that the coefficient is independent of ordinary variations of growth, to be substantiated by subsequent work; but the assumption that the wilting coefficient is directly related to other soil constants has been exploded. Conclusions (1) and (2) "are substantially correct for hygrophytes and mesophytes." It is further noted that "an important factor making for the substantial constancy of the wilting coefficient for a given soil is the extreme steepness of the curve connecting suction pressure and soil moisture content, in consequence of which differences of suction pressure of unquestionable significance from the standpoint of plant physiology give rise to differences in soil moisture content that are too small to be detected."

127. A MECHANICAL DEVICE FOR DETERMINING THE PERMANENT WILTING POINT OF SOILS BY MEANS OF THE COHESION METHOD. By G. J. Bouyoucos. (*Soil Sci.*, 46, 1938, 4, p. 331. From *Exp. Sta. Rec.*, 80, 6, 1939, p. 735.) The principle of the method is that at or above the wilting point the soil moisture film is sufficiently thick to cause the soil particles and granules to cohere when lightly pressed together, but below the wilting point the moisture film becomes too thin and discontinuous and is held with such great attractive forces that no such cohesion occurs. As first described, the method involved pressure applied by means of a spatula held in the hand. The present procedure

substitutes metal rollers pressing upon the soil by their own weight only in order to provide a more nearly constant pressure.

[Cf. Abstr. 74, Vol. XVI. of this Review.]

128. SOIL CONSERVATION v. INSECT CONTROL. By K. H. Harris. (*Proc. Ent. Soc. Wash.*, **41**, 1, 1939. From *Rev. App. Ent.*, xxvii., Ser. A, 7, 1939, p. 342.) The author discusses, chiefly from the literature, the often conflicting cultural measures necessary for soil conservation and insect control, and tabulates the contrasting features. The methods of insect control contributing to soil depletion include clean culture, burning over the land after harvest, and the elimination of grass and trees near growing crops.

129. SOIL AND WATER CONSERVATION. By D. Aylen. (*Rhod. Agr. Jour.*, xxxvi., 1939, pp. 12, 452, 534, 578, 675.) A discussion of the problem as it affects Southern Rhodesia. Pt. I. deals with the importance of the water conservation problem, and the methods advocated of conserving water by contour ridges, bench terraces, check dams, windbreaks, etc.; Pt. II. describes the construction of the various soil conservation works; Pt. III. is concerned with soil conservation and farming. The need is stressed for improved farming practice, which includes sound crop rotation, good ploughing, cultivation, and manuring of the soil. The various sections of the paper are well furnished with photographs and diagrams.

130. A COMPREHENSIVE LEGEND FOR SOIL MAPS. By R. E. Storie. (*Amer. Soil Survey Assoc., Bull.* 17, 1936. From *Exp. Sta. Rec.*, **80**, 4, 1939, p. 451.) The author considers that more complete information concerning the soils mapped than is now customary should be included with the map itself, and gives an illustrative example of such a summary as could be thus printed on a map. The added information includes among other points the "Storie index" of agricultural value.

131. A MODERN CONCEPTION OF SOILS, FERTILIZER ACTION, AND PLANT NUTRITION. By E. Truog. (*Natl. Fert. Assoc. Proc.*, **14**, 1938, p. 66. From *Exp. Sta. Rec.*, **80**, 3, 1939, p. 310.) This is an historical sketch of the growth of practical soil and plant-food knowledge from about 160 years ago to the present time. The topics considered are the rise of chemistry, soil recognized as a distinct natural body or entity, soil as a three-phase system, base-exchange material as a storehouse, iron oxide and other compounds, soil testing, proper interpretation of soil tests, and the minor nutrient elements.

132. WHAT HAPPENS TO THE RAIN ? By B. A. Keen. (*Qtrly. Jour. of Roy. Met. Soc.*, xlv., 1939, p. 123. From *Rpt. for 1938 of Rothamsted Exp. Sta.*) An annual rainfall of 30 inches means that 3,000 tons of water fall on an acre of land. In the course of the year this all disappears, by run-off, evaporation, transpiration through vegetation, and by downward percolation. The relative importance of these factors in British and overseas conditions is discussed. Many of the traditional beliefs among farmers and gardeners were based on a theory of water movement that was attractively simple to understand—but incorrect. It is only in recent years that the true picture of the movement of water in the soil has been built up. In consequence, some of the traditional practices need revision, while others now have a different explanation. The new work has also clarified some of the concepts used in hydrology.

133. BIBLIOGRAPHY ON SOIL EROSION AND SOIL AND WATER CONSERVATION. By S. H. Gaines *et al.* (*U.S. Dpt. of Agr. Misc. Pub.* 312, 1938. From *Exp. Sta. Rec.*, **80**, 3, 1939, p. 310.) This work is a group of separate bibliographies on erosion and conservation in general: climate and physiography as related to soil erosion; drought; economic and farm management phases of soil conservation; educational phases of soil conservation; engineering in erosion control;

flood control and related subjects; forest cover in soil and water conservation; gullies; land-use planning and surveys for soil and water conservation; legislation; pasture and range management; run-off and soil loss; soil structure, fertility, and moisture studies; stream flow, sedimentation, and related subjects; vegetative and tillage control in general; wild-life management as related to soil conservation; wind erosion, wind breaks, and shelter belts; and wood lots. These bibliographies are preceded by a list of citations by geographic regions and are followed by an author index. Brief abstracts are given of the publications cited.

134. SOIL EROSION CONTROL. By A. E. Burges. (Turner E. Smith and Co., Atlanta, Ga., U.S.A., 1937. From *Exp. Sta. Rec.*, **80**, 4, 1939, p. 456.) The author expresses the opinion that although much has been written concerning soil erosion, this material has usually been contributed "by those only superficially acquainted with the subject or by specialists unable to see the subject as a whole. . . . Not until now has there been available to the public any book in which this bewildering mass of data has been reduced to its essentials. This volume presents erosion control as an organized whole—a new science borrowing freely from soils, agronomy, forestry, animal husbandry, and engineering, yet being none of these. As it is developed here, soil erosion control embraces every phase of farm management which has a bearing on the preservation of the soil."

135. SOIL EROSION AND ITS CONTROL IN CENTRAL INDIA AND RAJPUTANA. By Y. D. Wad. (*Agr. and Livestock in India*, ix., **5**, 1939, p. 537.) Reasons and suggestions for the application of preventive measures to reduce the effects of rain-wash on Central Indian soils. Observations on the necessity for State initiative.

136. A NOTE ON THE PREVENTION OF THE EXTENSION OF EROSION IN RAVINE LANDS AND IMPROVEMENT OF FODDER AND GRAZING IN WASTE AND RAVINE LANDS. By D. L. Shah. (*Agr. and Livestock in India*, ix., **5**, 1939, p. 575.) A study of methods for the reclamation of eroded (ravine) lands in the United Provinces. Afforestation schemes have been abandoned, but experience has shown that controlled grazing, or closure to grazing, has produced excellent fodder reserves, and has attained the object of stopping soil erosion in ravines. Detailed particulars are given of alternative schemes of management designed to make full use of the grass while preventing further erosion.

137. THE RÔLE OF STRIP-CROPPING IN EROSION CONTROL IN THE BLACKLANDS OF TEXAS. By E. B. Deeter. (*Amer. Soil Survey Assoc., Bull.* 17, 1936. From *Exp. Sta. Rec.*, **80**, 4, 1939, p. 456.) The author reports experiments in which erosion was markedly reduced by alternate strip-cropping of oats with cotton as compared either with cotton grown in rows down the slope or cotton alone on the contour. He further expresses the opinion that where terracing is also needed, but cannot be done at once, strip-cropping "will usually afford an excellent degree of protection until it is found possible to terrace the land."

138. THE USE OF LEVEL CONTOUR BANKS AND LIVE OR DEAD WASH STOPS IN EROSION CONTROL IN NATIVE AREAS. By C. Maher. (*E. Afr. Agr. Jour.*, v., **3**, November, 1939, p. 190.) A discussion of the following methods of preventing soil erosion in native areas: simply constructed contour banks; hedges of such plants as *Coleus* sp., *Dracæna* sp., and *ojuok*; lines of long grass or other live vegetation; lines of dead material such as maize or sorghum stalks.

139. TWO LEVELLING INSTRUMENTS. By F. B. Wade and A. Cawley. (*E. Afr. Agr. Jour.*, iv., **4**, 1939, p. 304.) Describes two instruments designed by two members of the Geological Division, Tanganyika Territory: (a) a striding level for contour ridging and (b) a frame for levelling. Diagrams of both instruments are included.

140. NOTES ON THE USE OF THE STRIDING LEVEL WHEN LAYING OUT CONTOUR BANKS. By A. H. Savile. (*E. Afr. Agr. Jour.*, v., 3, 1939, p. 195.) The writer, after experimenting with the striding level mentioned in the previous abstract, strongly recommends its trial by those concerned with the construction of contour banks. A modification of the original instrument has been introduced to enable the level to be used for the lay-out of banks having a variable grade. A description is also given and a diagram included of an attachment for use in conjunction with the striding level in order to find the degree of slope and correct distance apart for lay-out of contour banks.

141. THE RIDGER GRADER. By D. Aylen. (*Rhod. Agr. Jour.*, March, 1940, p. 151.) Describes an implement devised to work in conjunction with a plough and ditcher or with a plough only, with the object of facilitating the work of rebuilding old ridges which have become too low, widening existing narrow ridges so that they can be planted to a field crop, and constructing new broad ridges. Its usefulness in expediting such work has been demonstrated in a number of instances. A diagram of the construction and illustrations showing the grader at work are included.

142. HANDBOOK OF FERTILIZERS: THEIR SOURCES, MAKE-UP, EFFECTS, AND USE. By A. F. Gustafson. (Orange Judd Pubg. Co., New York, 1939, 3rd ed. From *Exp. Sta. Rec.*, 81, 3, 1939, p. 346.) The chapter headings are: Requirements for Plant Growth, Nitrogenous Fertilizer Materials, Phosphatic Fertilizer Materials, Potash Fertilizer Materials, Effect of Fertilizers on Crops and Soils, Factory Mixed Fertilizers, Home-mixing of Fertilizers, Purchase and Use of Fertilizers, Liming in Relation to Fertilizer Practice, and Organic Matter in Relation to Fertilizer Practice and Use.

143. EFFECT OF NITROGEN, PHOSPHORUS, AND POTASSIUM IN FERTILIZERS ON THE EARLINESS OF COTTON. By H. B. Brown and H. W. Pope. (*Louisiana Sta. Bull.* 306, 1939. From *Exp. Sta. Rec.*, 81, 5, 1939, p. 641.) The effect of each of three nutrient elements on earliness of cotton was studied, 1927-31, in connection with fertilizer tests noted earlier. Cotton receiving heavy applications of phosphorus produced higher percentages of seed cotton at first picking, had a higher blooming rate in the first two weeks of the blooming period, and resulted in higher yields of seed cotton than cotton receiving no phosphorus (NK) or no fertilizer. Plats heavily fertilized with nitrogen did not differ much from no nitrogen (PK) or no fertilizer plats in earliness or rate of blooming, but were consistently higher in yield. Potassium seemed to retard boll-opening as compared with no potassium (NP) or no fertilizer, was similar in blooming rate, and greatly outyielded these plats in order. When the three elements were heavily applied respectively in complete fertilizers, cotton receiving the heavy application of phosphorus was outstanding in blooming rate during the first four weeks and very little behind in the fifth week. Plats receiving heavy applications of nitrogen or potassium, not significantly different from each other, were intermediate between the unfertilized and the heavy phosphorus plats in blooming rate. Over the period fertilized plats showed an upward trend without differing greatly, although cotton receiving heavy potassium treatment seemed outstanding in three of five years. Unfertilized plats showed a downward trend in yield. A heavy rate of blooming as indicated by the phosphorus curve did not necessarily mean high yields.

144. FERTILIZING CONSTITUENTS OF COTTON BURS OR COTTON BUR ASHES AND THEIR EFFECT ON CROP YIELDS. By H. J. Harper *et al.* (*J. Amer. Soc. Agron.*, 30, 10, 1938, p. 827. From *Exp. Sta. Rec.*, 80, 4, 1939, p. 476.) Effects on the yield of seed cotton of applying cotton burs and their ashes to Kirkland soil were studied, 1926-27. Three tons of burs applied at three-year intervals either

ploughed or disked into the soil gave as good returns as 6 tons on adjacent plats treated similarly. The average increase over the checks was 189 lb. per acre when 3 tons were ploughed under and 166 lb. when disked into the soil. The average gain from 6 tons disked in was 170 lb. of seed cotton. Ashes from either 3 or 6 tons of burs produced only about one-half as great an increase in yield as did the burs. Cotton burs collected from 22 counties in Oklahoma were found to contain averages of ash 8.73, nitrogen 1.04, phosphorus 0.1, calcium 0.65, potassium 3.39, and magnesium 0.25 per cent. on a moisture-free basis. The average quantities of different oxides found in cotton bur ashes were phosphoric acid (P_2O_5) 2.68, calcium oxide 10.41, potassium oxide 45.15, and magnesium oxide 4.76 per cent.

145. BORON IN AGRICULTURE. (Issued by the Boron Agr. Bur., London. March, 1940.) *Cotton*.—In 1932 Eaton published a report of experiments carried out on cotton plants grown in sand cultures, in which the essential nature of boron was first demonstrated. Progressive improvement both in the growth and in yield of bolls was obtained in nutrient solutions up to concentrations of 10 parts per million, beyond which slight toxic symptoms became apparent in the leaves. Tokuoka and Dyo in 1937 found that a small amount of boron increased the growth of cotton and accelerated flowering, but retarded root development. In Alabama, in the same year, Naftel obtained large increases in growth by applying borax to soils which had been overlimed. The beneficial influence of boron on plants grown in salty and non-salty soils has been established by Novikov and Sadovskaja in 1939 by soaking the cotton seeds for 48 hours in dilute solutions of boric acid. The net result is stated to be greater development, better growth and fruiting, and an increased number of ripened bolls, particularly on salty soils. The authors make no reference to the more practical method of applying boron by broadcasting borax or boric acid over the seed-bed during the course of its preparation.

146. BORON AS A PLANT NUTRIENT. By D. H. Jameson and C. M. Schmidt. (American Potash Inst. Inc., Washington, D.C., 1939. From *Rev. App. Mycol.*, xviii., 10, 1939, p. 702.) This supplement to the annotated bibliography of the literature of boron as a plant nutrient, published by the American Potash Institute, contains 172 items.

147. A MICROCHEMICAL STUDY OF THE EFFECTS OF BORON DEFICIENCY IN COTTON SEEDLINGS. By C. H. Wadleigh and J. W. Shive. (*Soil Sci.*, 47, 1939, 1, p. 33. From *Exp. Sta. Rec.*, 80, 5, 1939, p. 641.) "The development of boron deficiency symptoms in cotton seedlings was followed microchemically. As the symptoms increased in severity, scattered cells throughout the tissues of the stem tips were observed to become much more acid than the normal cells of these tissues. Ammonium nitrogen was observed to accumulate, especially in the more acid cells, although no ammonium nitrogen was supplied to these plants. Sugars were found to accumulate. Protein tests indicated a progressive degeneracy of the protoplasm. It is suggested that in the absence of boron the normal course of protein synthesis is altered."

148. INFLUENCE OF BORON ON FLOWER-BUD DEVELOPMENT IN COTTON. By K. T. Holley and T. G. Dulin. (*J. Agr. Res.*, 59, 7, 1939, p. 541.) Water-culture studies of the boron requirements of cotton indicated that this element is essential for flower-bud development in the plant, the concentration necessary for this development being higher than that required for vegetative growth. There is no evidence from these studies that boron has any relation to flower-bud initiation in cotton.

149. RELATION OF SULPHATE TO SELENIUM ABSORPTION BY PLANTS. By A. M. Hurd-Karrer. (*Amer. J. Bot.*, 25, 1938, 9. From *Exp. Sta. Rec.*, 80, 6, 1939,

p. 745.) Analyses indicated that the absorption of the selenium of sodium selenate varies directly with the amount available to the plant and (within limits) inversely with the sulphate concentration. However, although in both nutrient solutions and soils the Se absorption was sometimes reduced by excess sulphate to one-tenth that in corresponding low-sulphate cultures, it was never entirely prevented. The effect of sulphate in reducing the Se content of the several crop plants analysed was more pronounced with young green plants than with old ones. The antagonism is discussed in relation to the idea that Se can be utilized instead of S in the synthesis of organic compounds. This theory and the quantitative relations shown by the data have suggested a possible explanation of the effect of S as a mass effect of an element sufficiently similar to Se as to preclude selectivity.

150. COMPOST. By S. D. Timson. (*Rhod. Agr. Jour.*, xxxvi., 1939, No. 10 and subsequent issues.) A reprint of an article first published in November, 1937. The opportunity has now been taken to add to and revise the paper in the light of further experience.

[Cf. Abstr. 304, Vol. XV. of this Review.]

151. COMPOST NOTES. By S. D. Timson. (*Rhod. Agr. Jour.*, xxxvii., 1, 1940, p. 14.) Notes on improving the aeration of the heap, and on a device for turning the heap.

152. DEVELOPMENT OF MODERN COMPOSTING METHODS. By Y. D. Wad. (*Agr. and Livestock in India*, ix., 5, 1939, p. 543.) A review of the principal publications on composting methods from Richards and Hutchinson (1921), who developed the Adco process, to the proposal of Howard (1937) for "sheet composting," in which the process is carried out on the surface of the field to be manured. The author concludes that perhaps the most economic and convenient method will be found in the preliminary aerobic decomposition of waste material followed by its direct application before preparatory cultivation begins.

153. COMPARISON OF DIFFERENT METHODS OF COMPOSTING WASTE MATERIALS. By C. N. Acharya. (*Ind. J. Agr. Sci.*, ix., 3, 1939, p. 565.) Special attention was paid to the "hot" fermentation method, wherein compost material was kept aerobic for a preliminary period of 5-6 days, during which time there was rapid decomposition and rise of temperature to 65-70° C. At the end of this period the mass was covered with a layer of mud paste and over it earth, and kept closed for about 2½-3 months to allow anaerobic rotting to take place. The manure was then ready for spreading on the land. The hot fermentation process was compared with the aerobic methods in ordinary use in the country, and gave about 1½ times as much manure as these methods.

STATISTICAL TREATMENT, CULTIVATION, IRRIGATION, GINNING, ETC.

154. A MODERN STATISTICAL ANALYSIS FOR FIELD EXPERIMENTS: THE ANALYSIS OF VARIANCE FOR SIMPLE FACTORIAL EXPERIMENTS. By R. J. Borden. (*Hawaii Planters' Rec.*, 48, 2, 1939, p. 73. From *Exp. Sta. Rec.*, 81, 6, 1939, p. 776.) The non-technical discussion of the application of the analysis of variance presented shows by actual example how results from field experiments can be set up and examined for evidence that measured yield differences between treatments are really an effect of the treatments and not more likely due to chance. Plans and analyses for the simpler forms of factorial experiments are offered as a suggested improvement in experimental technique.

155. FIELD TRIALS: THEIR LAY-OUT AND STATISTICAL ANALYSIS. By J. Wishart. (Imp. Bur. of Plant Genetics, Cambridge, 1940. Price 2s. 6d.) This bulletin

is said to be designed for the beginner, but most beginners will find they need other assistance if they are to master the contents. It is difficult to believe that a bulletin of this size could be written which would meet the needs of the average man with average mathematical knowledge but no training in statistics. As a small and compact guide and reminder to the man who has taken a course of lectures in statistics, however, it is sound, and can be recommended. The author deals with all the more important experimental designs and the analysis of the data obtained from them. References are given to recent manuals and other publications dealing with special types of experiments.—J. B. H.

156. VARIABILITY OF PLOTS OF VARIOUS SHAPES AS AFFECTED BY PLOT ORIENTATION. By B. G. Christidis. (*Emp. J. Exp. Agr.*, vii., 1939, p. 330.) Confirms previous conclusions that for all practical purposes long narrow plots control soil heterogeneity considerably better than square ones. The data analysed were obtained from 1,024 units (4-metre lengths of row) in blocks of cotton planted by the Cotton Research Institute, Thessalonika, Greece.

[*Cf. Abstrs.* 397, Vol. XII.; 264, Vol. XII.; and 466, Vol. XVI. of this Review.]

157. COTTON: LAND PREPARATION, PLANTING AND CULTIVATION. Compiled by E. E. Gross. (*Miss. Sta. Bull.* 323, 1938. From *Exp. Sta. Rec.*, 80, 3, 1939, p. 335.) Information compiled from reports of experiments by State Experiment Stations and the U.S. Dept. of Agriculture covers seedbed preparation, seed treatment, planting, spacing, and cultivation.

158. COTTON SEED TREATMENT. By S. G. Lehman. (*U.S. Dept. Agr., Exp. Path.*, No. 37, 1939, p. 32. From *Exp. Sta. Rec.*, 81, 2, 1939, p. 227.) This is a review of some of the recent work, with a bibliography of eighteen titles.

159. DELINTING AND GERMINATION OF COTTON SEEDS AS AFFECTED BY $ZnCl_2 \cdot 2HCl$ TREATMENT. By B. N. Singh and S. L. Kapoor. (*Ind. Jour. of Agr. Sci.*, ix., 5, 1939, p. 731.) The data recorded in this paper were gathered to estimate the degree of delinting and germination effects in Indian and American varieties of cotton following seed immersion for various durations in $ZnCl_2 \cdot 2HCl$. The solution used in this work readily dissolved the fuzz present on cotton seeds. The seeds of American type were found to be slightly more resistant where for complete removal of the fuzz 10 to 15 minutes' soaking was essential against 5 minutes in the case of type C402. Doses shorter than 5 minutes were insufficient to cause complete delinting. The germination process was greatly activated by $ZnCl_2 \cdot 2HCl$ treatment of seeds. Doses of 5 to 15 minutes' duration were very satisfactory in this regard. Such treatments initiated early start, higher percentage and early completion of germination. The permanency of the effects of these treatments was well evidenced by the resulting seedlings, which were taller and accumulated greater dry matter than their controls.

160. DIBBLE-SOWING OF COTTON. METHOD, EFFECTS AND PROFITS. By D. S. Gracie and W. L. Balls. (*Bull. No. 229, Min. of Agr., Egypt, 1939.*) Originally tried many years ago as an expedient for economizing pedigree seed, dibble-sowing is now put forward with a wealth of experimental support as a method suitable for general agricultural practice in Egypt. The evidence indicates that its general adoption would add not less than a million kantars to the crop.

After a preliminary watering a turned wooden dibble is used to make conical holes 1 inch deep and about 1 inch across, each surrounded by a flat surface about $\frac{1}{2}$ inch wide. Not more than five seeds are dropped into each hole, and covered with sand or silt. Details are given of a magazine dibble to carry 1 lb. of seed and drop the right number into each hole as it is made. For this method delinted seed is essential. Owing largely to the economy of seed

the cost of dibble sowing is not materially higher than that of the usual operations, but the number of boys required at sowing time is trebled unless mechanical means are adopted.

The effects of dibble-sowing have been tested in more than 500 field comparisons, covering all available variations in agricultural conditions. A very small proportion failed to show an increase, and the average yield advantage is 0.70 kantar per feddan, roughly 70 lb. per acre. The advantage appears to be principally due to reduction of competition and of disturbance in subsequent thinning (the usual seed rate is 10 to 20 seeds per hole), resulting in a better stand of plants in "best condition," which give a greater proportion of their yield in the first picking. There is thus an important increase in quality as well as quantity. The superior type of plant obtained is more susceptible to water or soil deficiencies, and results which show decreases are mainly attributable to such causes.

161. LES EFFETS DU SOL, DE LA SAISON ET DE LA FUMURE SUR LA VÉGÉTATION ET LE RENDEMENT DU COTONNIER. By D. S. Gracie. (*L'Égypte Agricole*, Cairo, March, 1939, p. 150. From *Bull. Agr. du Congo Belge*, xxx., 2, 1939, p. 330.) A discussion of the correlations between the yield and the manuring of cotton, taking account of other factors such as the climatic conditions, the physico-chemical conditions of the soil, the sowing date, irrigation date, and a new method of dibble-sowing which appears advantageous.

162. SAND CULTURE OF COTTON PLANTS. By H. S. Olcott. (*Sci.*, 89, 2322, 1939, p. 608. From *Exp. Sta. Rec.*, 81, 4, 1939, p. 506.) Technique and a nutrient solution are described.

163. DRYING SEED COTTON. By F. L. Gerdes *et al.* (*U.S. Dpt. of Agr. Leaflet* 181, 1939. From *Exp. Sta. Rec.*, 81, 4, 1939, p. 583.) A 17-floor drier at a temperature of 150° F. removed moisture from about 1 lb. per 100 lb. of seed cotton with less than 12 per cent. moisture to 3 lb. from cotton having 16 per cent. or more. The percentage removed from each of these cottons at temperatures up to 250° was only slightly greater than at 150°. This result was attributed to the relatively short exposure in the drier (15 seconds) and the fact that the relative humidity of the air heated to the higher temperatures is not appreciably lower than that at 150°. The moisture removed from lint per 100 lb. by drying for 15 seconds at 150° ranged from an average of 1.5 lb. for seed cottons below 12 per cent. in moisture to an average of 4 lb. for those having 16 per cent. or more. It increased slightly with higher drying temperatures. Actual differences in the weight of bales due to drying are not permanent. The results of a storage test showed that a bale of undried (damp) cotton rapidly lost weight; that a dried bale gained slightly; and that, at the end of 10 weeks, the bales differed in weight by only 4 lb. as compared with 16 lb. at the beginning of the storage period. Fibre was not weakened by drying at 200°, but there was a slight weakening when the material was dried twice at 250°. Staple length, on an average, was preserved at 150°, but, in general, higher drying temperatures resulted in ginned lint with slightly shorter staple length. It was found better to pass wet cotton twice through a drier at 150° than once at a temperature above 200°. Average improvements in grade of cotton (the combined influence of generally smoother preparation and occasionally brighter colour and reduced leaf) resulting from artificial drying were greater for the cotton $1\frac{1}{8}$ inches and longer than for the shorter staples. Drying at a temperature of 150° with the 17-floor drier showed benefits in grade ranging on an average from about one grade for either length group having 16 per cent. or more of moisture to about one-third of a grade for the longer cottons having from 8 to 11.9 per cent. and the shorter cottons having from 12 to 15.9 per cent. of moisture. The average

gain in bale value was from 70 cents for short staple to \$2.50 for long staple cotton, as against an operating cost of from 5 to 30 cents per bale for drying. It was further found that drying usually eliminates chokages and breakdown and permits some increase in ginning capacity. Inexpensive cleaner-driers economically practical for the small gin have been devised. As sources of heat, steam, engine-cooling water and engine exhaust, and furnace heating are mentioned, and the possibilities of combinations of these sources are briefly indicated.

164. OVERHEAD CLEANER-DRYING SYSTEMS FOR SEED COTTON. By C. A. Bennett and C. S. Shaw. (*U.S. Dpt. Agr. Misc. Pubn.* 314, 1938. From *Exp. Sta. Rec.*, **80**, 6, 1939, p. 833.) From 5 years' tests at the U.S. Dept. of Agriculture cotton ginning laboratories on equipment for from 1- to 3-stand gins, the authors conclude that seed cotton can be dried effectively and economically by introducing heated air either into the suction line entering an overhead air-line cleaner or into an overhead out-of-the-air cleaner. The air-line cleaner-drier within certain limitations has proved satisfactory under test, and meets the requirements of the Government process. It and some of the methods of applying hot air to out-of-the-air cleaners are described. Diagrams of the various forms of cleaner-drier here discussed are included, together with dimensioned drawings of iron pipe air heaters and photographic cuts showing home-made and commercial set-ups and parts of installations.

165. AIR-BLAST GIN: PERFORMANCE AND MAINTENANCE. By A. J. Johnson and T. L. Baggette. (*U.S. Dpt. Agr. Circ. No.* 510, 1938. From *Summ. of Curr. Lit.*, **xx**, 2, 1940, p. 22.) The air-blast gin employs a jet of air under 9 to 15 inches of water pressure to remove ginned lint from the saw cylinder. About one-third of the crop in the U.S.A. was ginned by such machines in 1935. The present circular reports an investigation, on 42 cottons in double-rib huller-type gins with 12-inch saws, of the effect of the air pressure on doffing. The best pressure appears to be about 12 inches. A reduction to 9 inches, especially on damp cotton, caused a reduction in lint quality and output, together amounting to a loss of 80 cents or more for damp cotton and 33 to 45 cents for dry cotton in the value of the bale, on prices ruling in 1932-33 to 1935-36. An increase to 15 inches was accompanied by a fall in bale value for both damp and dry cotton.

166. PREVENTING GIN DAMAGE TO COTTON. By F. L. Gerdes and C. A. Bennett. (*U.S. Dpt. Agr. Leaflet* 169, 1938. From *Exp. Sta. Rec.*, **80**, 5, 1939, p. 690.) Dampness of the seed cotton and wear, inaccurate adjustment, or inaccurate speed regulation in the gin are found the main causes of gin damage. Unevenness, with resulting loss in grade and price, will result from ginning into the same bale cotton not uniform with respect to moisture, foreign matter, fibre length, colour, strength, etc., also from non-uniform gin operation practices. Mechanical driers, commercial or home-made, will largely eliminate the damp cotton troubles. In the gin itself, use of saws one-sixteenth inch under size, due to wear and sharpening, broken saw teeth, incorrect tooth pitch, and worn ribs, are to be avoided; and saws must be run at or near the specified speeds. In brush doffing, reasonable departures from the standard of 6,666 lin. feet per minute are harmless, but brushes must have full-tooth mesh with the saws, and worn or saw-cut bristles cause poor doffing and gin damage. In air-blast doffing, correct nozzle pressure must be maintained and is best checked by air-blast gauges. Corrections of the setting of seed, mote, and dividing boards are similarly dealt with, as is the timing of the feeder speed. Feeder speed must be equal to or less than manufacturer's specification to avoid tight seed rolls and concomitant gin damage. Roughness and projections in lint flues and condensers may also cause damage and interrupted operation.

167. REPORT ON THE MEASUREMENT OF THE QUANTITY OF DUST IN THE ATMOSPHERE OF COTTON GINNERIES. By H. E. Hurst and P. A. Curry. (Min. of Public Works, Egypt, *Phys. Dpt. Paper No. 39*. Pubd. Schindler's Press, Cairo, 1939. Price P.T.5 or 1s.) Describes apparatus designed for testing the amount of dust in the atmosphere of ginneries, and gives an account of its trials. Various ginneries have put in aspirators designed on the sound principle of removing the dust where it is formed—i.e., at the gins. The efficiency of some of these has been tested, but it is not considered that the problem of ventilating cotton ginneries has been brought to such a point that definite recommendations can be made as to what is the best apparatus to employ.

168. COTTON: DRYING IN FIELD OF SHORT-WAVE CONDENSER. By A. A. Morozov. (*J. App. Chem. Russ.*, 1938, ii., p. 1675. From *Summ. of Curr. Lit.*, xix., 18, 1939, p. 524.) The rate of drying of cotton in the field of a short-wave condenser (wave-lengths 10.7 and 14.85 m.) is greater than in a thermostat at 100 to 105°. The cotton is whiter and less modified than by ordinary drying, but its water content cannot be reduced below 1.5 to 3.5 per cent.

169. COTTON BALES: PHYSICAL PROPERTIES. By A. C. Johnson *et al.* (*U.S. Dpt. of Agr. Tech. Bull. No. 263*, 1938. From *Summ. of Curr. Lit.*, xix., 19, 1939, p. 554.) Gives a full account of experiments on the fumigation of baled cotton with prussic acid. Incidentally, miscellaneous facts are included about the physical properties of bales. Thus, a 500-lb. flat bale at the ginnery is in bulk more than seven-eighths air and after compression into the standard bale is still three-quarters air. A 42-cubic-foot flat bale when compressed under 2,000 lb. per square inch pressure into a 9-cubic-foot bale is still two-thirds air. When placed in a chamber with walls at 190° F. the bale warms up from 46 to 79° F. at a depth of 3 inches in 2 hours.

170. COTTON SEED BY-PRODUCTS. (*Farmg. in S. Afr.*, xv., 166, January, 1940, p. 33.) It is usually considered that 2,000 lb. of cotton seed will yield 300 lb. of oil, 750 lb. of cake, and 800 lb. of hulls, and that a total of 150 lb. of material is lost as a result of evaporation and waste. Cotton-seed cake is one of the most valuable of concentrated foods for dairy cattle. Cotton-seed oil is used in many ways—e.g., as salad oils, for illuminating purposes, medicines, soaps, and in the manufacture of roofing, linoleum, etc. The linters, consisting of fine fluff from the seed, are delinted in the ginneries after the lint has been taken off, and are used largely in the manufacture of explosives, felt, blotting paper, upholstering in the motor and the furniture trades, etc.

PESTS, DISEASES AND INJURIES, AND THEIR CONTROL.

171. AGRICULTURAL PRODUCTS AS INSECTICIDES. By R. C. Roark. (*Industr. Eng. Chem.*, 31, p. 168, Easton, Pa., 1939. From *Rev. App. Ent.*, xxvii., Ser. A, 11, 1939, p. 593.) Although the materials now largely used for this purpose (compounds of arsenic, fluorine, lead, copper and sulphur) are of mineral origin, vegetable products are being used to an increasing extent. This is because many organic compounds are more toxic to insects but less toxic to man than are lead arsenate and other inorganic poisons. In addition to organic insecticides that exist naturally in plants, such as nicotine, anabasine, the pyrethrins, rotenone, groundnut oil, and other plant oils, products derived from coniferous trees, such as pine-tar oil, are also valuable insecticides, and synthetic compounds derived from oils, alcohols, furfural and other promising plant products are now coming into commercial use as insecticides. It is conjectured that in the future insecticides will be mostly organic compounds obtained from plants now regarded as worthless weeds or synthesized from products of plant origin. The

possibilities of constructive chemical research in this field are boundless and should result in numerous products of great economic value.

172. BRAZIL: OBSERVAÇÕES SOBRE AS PRÁGAS DA CULTURA ALGODOEIRA NO NORDESTE E NORTE DO BRASIL. By E. J. Hambleton and H. F. G. Sauer. (*Arq. Inst. Biol.*, **9**, p. 319. S. Paulo, 1938. With a summary in English. From *Rev. App. Ent.*, xxviii., Ser. A, **1**, 1940, p. 11.) The most important pest was *Gasterocercodes brasiliensis*, Hambl., which was parasitized by *Heterospilus annulicornis*, Mues., *H. gossypii*, Mues., and *Eurydinoteloides longiventris*, Gah. Losses due to *Platyedra gossypiella* were greatest in the forest region. The larvae were parasitized by *Microbracon vulgaris*, Ashm., *Apanteles* (?) *balthazari*, Ashm., *Perisierola nigrifemur*, Ashm., and *Spilochalcis simillima*, Ashm. Other pests attacking cotton included *Alabama argillacea*, *Chalcodermus bondari*, *Ozycarenum hyalinipennis*, *Gargaphia torresi*, *Aphis gossypii*, *Schistocerca australis*, *Atta sexdens*; various minor pests such as *Pinnaaspis minor*, *Saissetia depressa*, *Phenacoccus gossypii*, *Pseudococcus brevipes*, *Empoasca gossypii*, *Dysdercus maurus*, *Edessa mediatubunda*, *Acrocercops helicomitra*, *Cleisa hirta*; and the mites *Tarsonemus latus*, *Tetranychus telarius*, and *Eriophyes gossypii*.

173. COTTON PESTS IN BURMA. By A. Ba Te. (*Bull.* No. 8, 1912, Dpt. of Agr. Burma. Revised 1939.) The hardy indigenous cottons of Burma, Wagale and Wagyi, do not suffer unduly from insect pests, though many are present. Descriptions are given of 22 pests, of which *Earias*, pink bollworm, and *Dysdercus* are the most serious. The bulletin is furnished with several illustrations.

174. EGYPT: INSECTS AND MITES INJURIOUS TO THE COTTON PLANT. By F. C. Willcocks and S. Bahgat. (Roy. Agr. Soc. Egypt, Cairo, 1937. Price £E3, postage extra.) This work of 785 pages and 14 large coloured plates forms Part 2 of Vol. I. of a projected series on "The Insect and Related Pests of Egypt," of which Part 1, "The Pink Bollworm," was issued in 1916. It embodies the experience of the senior author as Entomologist to the Society from 1904 to 1930, when he retired. The treatment is descriptive rather than analytical; Mr. Willcocks expressly disclaims possession of the complex scientific equipment or specialized knowledge necessary to the modern economic entomologist. So far as its appeal is directed to the layman the book may be held to benefit from this circumstance, and to the entomologist in other countries its descriptions of the status and behaviour of the insects destructive to or associated with the cotton plant in Egypt will be most useful. The arrangement is based on taxonomy, and the largest sections deal with the Orthoptera, amongst which the mole cricket (*Gryllotalpa gryllotalpa*, L.) is conspicuous; the Hemiptera, especially *Nezara*, *Creontiades* (the bud and boll shedder) and *Ozycarenum* (the cotton-seed bug), and the Lepidoptera, which include cutworms (*Agrotis*), the Egyptian Cotton worm (*Prodenia*), the spiny bollworm (*Earias*) and the pink bollworm (*Platyedra*). Besides these major pests the minor pests are adequately dealt with, and a wide range of occasional pests and associates is covered.

175. INDIA: REPORT OF THE IMPERIAL ENTOMOLOGIST. By H. S. Pruthi (*Sci. Rep. Agr. Res. Inst. New Delhi*, 1937-38, Delhi, 1939. From *Rev. App. Ent.*, xxviii., Ser. A, **1**, 1940, p. 1.) Studies were carried out in India on the fecundity and development of the spotted bollworm of cotton, *Earias fabia*, Stoll, and its parasites, *Microbracon lefroyi*, S. and G., and *Goryphus* (*Melcha*) *nursei*, Cam., at constant temperatures and saturation deficiencies. The fecundity of *E. fabia* was increased by high temperature during the development period, and by low saturation deficiency during adult life. The egg, larval and pupal stages lasted 11-12, 35 and 32-33 days at 16° C. (60.8° F.) and 7, 20 and 17-18 days at 20° C. (68° F.). Development was quickest at a saturation deficiency of 3 mm. At 100 per cent. relative humidity, which is the most favourable for *Microbracon*,

the maximum number of eggs per female and the average periods required for development from egg to adult in days were 39 and 27 at 16° C., 32 and 19 at 20° C., and 58 and 11 at 25° C. (77° F.). Females of *Goryphus* oviposit for preference on prepupæ. At 16° C. the number of eggs laid varied from 6 to 23, but usually at least 56 and sometimes 150 hosts were paralysed. In a saturated atmosphere the life-cycle at 16°, 20° and 24° C. (75-2° F.) required about 40, 26 and 19 days.

176. INSECT PESTS OF THE COTTON CROP IN JAVA. By C. J. H. Franssen and H. R. A. Muller. (*Landbouw [Buitenzorg]*, **14**, 5-6, 1938, pp. 321-363; Eng. abstr., pp. 361-362. From *Exp. Sta. Rec.*, **81**, 4, 1939, p. 542.) Some 28 species of insects that attack the cotton crop in Java are noted. Most of these are minor pests, but 5 of them occasionally cause serious damage—namely, the weevils *Hypomeces squamosus* and *Amorphoidea pectoralis*, the spiny bollworm *Earias fabia*, the pink bollworm, and a leafhopper of the genus *Empoasca*.

177. PERU: EL CULTIVO DEL ALGODONERO EN EL VALLE DE CAÑETE, EN RELACIÓN CON LAS PLAGAS ENTOMOLÓGICAS, EN 1939. By V. Marie. (*Informe No. 51*, October, 1939, Inst. de Altos Estudios Agr. del Peru, Estacion Exp. Agr. de la Molina, Lima, Peru.) Reports on the prevalence of cotton pests in the Valle de Cañete, Peru, and on measures recommended for control. The principal are *Heliothis virescens*, *Mescinia peruella*, *Anomis texana*, *Anthonomus vestitus*, *Aphis gossypii*, and a jassid, in this order.

178. INSECTS AND A MITE FOUND ON COTTON IN PUERTO RICO, WITH NOTES ON THEIR ECONOMIC IMPORTANCE AND NATURAL ENEMIES. By L. C. Fife. (*Bull. P. R. Exp. Sta. Mayaguez*, No. 39, Washington, D.C., 1939. From *Rev. App. Ent.*, xxviii., Ser. A, **2**, 1940, p. 79.) A list is given of 84 species of insect, and one mite taken on cotton in Porto Rico, and their parasites and predators, comprising those found by the author during 1935-37 and those reported by other workers. Notes are given on their economic importance and natural control.

179. SOUTH AFRICA: THE ENCOURAGEMENT OF BENEFICIAL INSECTS. By G. C. Ulyett. (*Bull. No. 189*, Pl. Indus. Series No. 27, Dpt. of Agr. and For. S. Afr., 1938.) An account of the general principles governing the possibility of encouraging beneficial insects, prepared as an answer to enquiries received. Examples are described to illustrate, with reference to South African conditions, the controlling influence of climatic conditions on the activity of parasitic insects, and of the limitations on the efficiency of control by parasites or predators imposed by changes in density of the host population.

180. SOUTHERN RHODESIA: COTTON PESTS IN 1938. By J. K. Chorley. (*Rhod. Agr. J.*, xxxvi., 1939, p. 601.) The cotton crop throughout the Colony suffered only comparatively mild attacks of insects. At Gatooma jassid caused some damage to Bancroft and the less hairy strains of U.4, and aphid was troublesome in February and March. Infestation of cotton by American bollworm (*Heliothis armigera*, Hubn.) was less than in many previous years. This is the most important pest and is being closely studied at Gatooma. Experiments with trap crops, such as *Dolichos*, Poona lubia, gram and other plants which may attract egg-laying moths away from cotton, were carried out. The policy of prohibiting ratooning much reduced the injury to the cotton crop from cotton stainers. Experiments in trapping stainers by means of cotton-seed traps were carried out, and marked success was obtained in trapping nymphs.

181. SWAZILAND: INSECT PESTS OF COTTON. By H. Hutchinson. (*Swaziland Agr. Rev. and Notes for Quarter ended 31/3/39*, p. 9.) A general account of the injury caused by pests to cotton in Swaziland, and the measures taken to control them, followed by detailed notes on the American bollworm, one of the major pests of cotton in the country. In Swaziland the host plants of the moth include

maize, kaffir corn, groundnuts, cowpeas, and various grasses and weeds. Cotton is susceptible to attack at any time during its long flowering period, but preference is shown for maize over cotton, and protection for the latter can therefore be arranged-by planting maize on such a succession of dates that the flowering periods coincide with those of cotton. Kaffir corn, groundnuts or cowpeas would also serve the same purpose.

182. UNITED STATES: REPORT OF THE CHIEF OF THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE, 1938. By L. A. Strong. (U.S. Dpt. of Agr., 1938. From *Rev. App. Ent.*, xxvii., Ser. A, 7, 1939, p. 376.) Work on the biological control of pink bollworm was continued. A consignment of a Korean parasite, *Microbracon nigrorufum*, Cushm., was received in 1938, and large numbers are being reared for liberation. Other parasites of *Platyedra* that were collected in Korea and shipped to the United States in 1938 were *M. (Habrobracon) pectinophoræ*, Watanabe, *Chelonus pectinophoræ*, Cushm., and *Pristomerus* sp. Bollworm survival was decreased by heavy winter pasturage of the cotton fields and by early winter burial of infected bolls followed by winter irrigation.

183. THE DISTRIBUTION OF INSECTS, SPIDERS, AND MITES IN THE AIR. By P. O. Glick. (*Tech. Bull. No. 673*, U.S. Dpt. of Agr., Washington, D.C., 1939. Price 25 cents.) A discussion of the results of an investigation carried out during the years 1926-31 inclusive to test the height to which insects can ascend in the air. The collection of the insects was facilitated by means of special traps fitted to the airplane wings. Some 1,314 flights were made in Louisiana and 44 flights in Mexico, the traps being in operation for 1,007 hours; 30,033 specimens of insects and spiders were taken at altitudes ranging from 20 to 15,000 feet; 18 orders of insects and of spiders and mites were collected, Diptera being the most abundant, followed by Coleoptera. Homoptera and Hymenoptera were taken at 14,000 feet—the highest altitude at which insects were found—but a spider was caught at 15,000 feet, the highest altitude at which any specimen was taken. Temperature was the most important factor regulating the numbers of insects found in the air at any given time; the optimum range was from 75° to 79° F. surface temperature. The maximum numbers of insects were found at sunset, at which time many crepuscular and night-flying moths, together with the day forms, were active. Rain after a long period of drought caused an increase in insect activity, and greater numbers were found in the upper air at such times. In the airplane collections of insects in Mexico the pink bollworm moth was found as high as 3,000 feet. This and other studies indicate that the pink bollworm moths are carried in the upper air currents for considerable distances.

The bulletin contains many tables of statistics, and several illustrations and diagrams; 79 references to the literature are also cited.

184. HEMIPTEROUS INSECTS OF COTTON IN ARIZONA: THEIR ECONOMIC IMPORTANCE AND CONTROL. By T. P. Cassidy and T. C. Barber. (*J. Econ. Ent.*, 32, 1, 1939, p. 99. From *Rev. App. Ent.*, xxvii., Ser. A, 8, 1939, p. 416.) As a result of tests that have been in progress since 1932, the identity of the species of Rhynchota responsible for the extensive staining of cotton in Arizona has been established. Of the 53 species known to be present, some of which are predators, only 15 have been shown to feed and breed directly on cotton, and most of the damage is caused by 8—viz., the Pyrrhocorid, *Dysdercus mimulus*, Hussey, the importance of which has been greatly overestimated; the Pentatomids, *Euschistus impictiventris*, Stal., *Chlorochroa sayi*, Stal., and *Thyanta custator*, F.; and the Capsids, *Lygus hesperus*, Knight, *L. pratensis oblineatus*, Say, *L. elisus*, Van D., and *Creontiades femoralis*, Van D. All these puncture the bolls, the lint becoming stained and often valueless. Control by dusting with sulphur and arsenicals is suggested.

185. THE INSECTS OF NORTH CAROLINA. By C. S. Brimley. (N. Car. Dpt. Agr., 1938. From *Exp. Sta. Rec.*, **80**, 3, 1939, p. 367.) An annotated list of insects of North Carolina and their near relatives, 10,128 in number, systematically arranged.

186. A SMALL CAGE FOR INSECT VECTORS USED IN PLANT INOCULATIONS. By N. J. Giddings. (*Phytopathology*, **xxix.**, 7, 1939, p. 649. From *Rev. App. Mycol.*, **xviii.**, 11, 1939, p. 756.) A description is given of a glass insect-container for inoculating plants by means of insect vectors which obviates the use of perishable rubber bands and unsatisfactory spring clips. It consists of a piece of glass tubing 22 mm. in diameter and 22 mm. high, a cloth cover, a grooved square of ground glass, a top bar, and two coil springs. The springs are attached to the bar and the glass square to hold the tubing inserted between them in position.

187. LE CYCLE VITAL DE LA TEIGNE DU COTONNIER AU CONGO BELGE. By P. Henrard. (*Rev. Zool. Bot. Afr.*, **32**, 1, 1939, p. 19. From *Rev. App. Ent.*, **xxvii.**, Ser. A, 11, 1939, p. 572.) A summary is given of observations on the life-cycle of *Platyedra gossypiella*, Saund., in the cotton-growing regions in the north of the Belgian Congo, where it is very widespread.

188. INIMIGOS NATURAIS DA *Platyedra gossypiella* (SAUNDERS) NO ESTADO DE SAO PAULO. VESPAS DEPREDADORAS E ESPECIES DE PARASITAS COM NOTAS SOBRE A SUA BIOLOGIA. By H. F. G. Sauer. (*Arq. Inst. Biol.*, **9**, p. 187. São Paulo, 1938. With a summary in English. From *Rev. App. Ent.*, **xxviii.**, Ser. A, 1, 1940, p. 10.) During the season of 1936-37 the average infestation by *P. gossypiella*, Saund., of the floral parts of cotton in the State of São Paulo was 42 per cent. Infested blossoms did not open fully, the larvæ within having secured the petals by a web. Predaceous wasps were found in December and January, 1937, to have destroyed 87.6 per cent. of the larvæ in such blossoms. Of 10 species taken in cotton fields, the most numerous, in order of increasing importance, were *Mischocyttarus cassununga*, Ihering, *Polybia sericea*, Ol., *P. occidentalis scutellaris*, White, and *P. atra*, Ol. Parasites reared from bolls infested by *P. gossypiella* that were kept in cages were *Perisierola nigrifemur*, Ashm., an unidentified Bethyloid of the same genus, *Spilochalcis simillima*, Ashm., two species of *Microbracon*, one of which is probably identical with *M. vulgaris*, Ashm., a species of *Apanteles* considered by C. F. W. Muesebeck to be undescribed, although it has been recorded in the Brazilian literature as *A. balthazari*, Ashm., an unidentified species of *Ichneumon* (*Ephialtes*) that parasitizes the pupa of *P. gossypiella* and was also reared from pupæ of *Diaphania hyalinata*, L., and *Ephialtes* (*Calliephialtes*) *dimorphus*, Cushman. Pupæ of an undetermined Encyrtid of a genus close to *Cerchysius* were observed in a larva of *P. gossypiella* hibernating in the fruit of *Hibiscus esculentus*.

Females of *M. vulgaris* oviposited in up to 8 larvæ per day, the average being 2.4. At 20° C. (68° F.) the period from oviposition to adult emergence averaged 26.7 days. Males and females were obtained in equal numbers. Females of *E. dimorphus* oviposited at the average rate of 8 eggs a day, but some individuals deposited up to 19. In some cases 3 eggs were deposited on a single host larva, but only one gave rise to an adult. The females also fed on the host larvæ, killing 15-18 in a day. The life-cycle from oviposition to adult emergence averaged 23 days, and the pre-oviposition period 12 days. Females lived for 34 days.

189. PINK BOLLWORM: OCCURRENCE AND CONTROL IN IRAN. (*Int. Rev. Agr.*, **30**, 1939, p. 154. From *Summ. of Curr. Lit.*, **xix.**, 19, 1939, p. 538.) Pink bollworm was first reported in Iran in 1937. Regions affected are named, and the main clauses of a Decree imposing control measures are stated.

190. PINK BOLLWORM IN U.S.A. (*Int. Cott. Bull.*, xvii., **68**, 1939, p. 450.) The House of Representatives in June voted the sum of \$906,800 for the eradication of the pink bollworm, which is considered to be a more dangerous pest to cotton than the boll weevil. The pest has been found in several counties of South and Central Texas during recent years, spreading into the American Cotton Belt from Mexico in spite of quarantine stations situated on all roads and railways leading out of the infested districts.

191. THE PINK BOLLWORM, *Platyedra gossypiella*, SAUND., IN THE WEST INDIES. By F. A. Squire. (Agr. Advisory Dpt., Imp. Coll. Trop. Agr., Trinidad, 1939.) This is the final report on a 3-year investigation specially financed. It deals only with points of immediately practical importance, wider aspects of the problem having been examined in a series of papers, of which a bibliography is supplied. The floral infestation may be as high as 40 per cent. During the boll phase the damage is greatly aggravated by wet conditions. The conditions affecting the immature stages are described, with especial reference to the diapause. Ideal conditions for the diapause are provided by ginneries and in storage, and the need of more attention to sanitary measures and the efficient treatment of seed is urged. Permanent legislation to secure a 3½ months' close season is advocated, combined with more uniform choice of planting season. These measures would remove the influence of secondary hosts which afford imperfect continuity. Efforts to establish control by parasites are being made in Puerto Rico, and the results should be applicable to the Lesser Antilles.

[Cf. Vol. XVI., pp. 194, 268; and Abstrs. 118, Vol. XIII.; **44**, **117**, **119**, **333**, **681**, Vol. XV.; **288**, Vol. XVI. of this Review.]

192. CONTRIBUTION TO THE STUDY OF THE APHIDS OF CENTRAL ASIA. By V. P. Nevskii. (*Bull. Univ. Asie Cent.*, **22**, 34, Tashkent, 1937, p. 291. From *Rev. App. Ent.*, xxvii., Ser. A, **10**, 1939, p. 552.) (In Russian, with English summary.) This paper comprises descriptions of two new species of aphids and of hitherto unknown forms of others. They include the male and sexual female of *Macrosiphum (Acyrtosiphon) gossypii turanicum*, Mordv., from cotton in Transcaucasia.

193. FOOD-PLANT CATALOGUE OF THE APHIDS OF THE WORLD, INCLUDING THE PHYLLOXERIDÆ. By E. M. Patch. (*Maine Sta. Bull.* 393, 1938. From *Exp. Sta. Rec.*, **81**, 5, 1939, p. 678.) The aphid forms appear under the plant families in alphabetical order, each followed by a reference to the literature and the host species. The food plant catalogue includes a bibliography, an index to plant families, and an index to aphids.

194. THE METEOROLOGICAL RÉGIME OF THE COTTON APHIDS AND THEIR DISTRIBUTION IN UZBEKISTAN. By I. N. Stepantzev. (In Russian.) (*Social. Sci. Techn.*, vii., No. 2-3, Tashkent, 1939. From *Rev. App. Ent.*, xxviii., Ser. A, **2**, 1940, p. 60.) In Uzbekistan cotton is attacked by several aphids, of which *Aphis gossypii*, Glov., *A. laburni*, Kalt., and sometimes *Macrosiphum (Acyrtosiphon) gossypii*, Mordv., cause the most damage. *A. gossypii* has two peaks in seasonal occurrence, in May-June and August-September, while *A. laburni* is present in numbers only in the spring. Observations over several years have indicated that the fluctuations in the numbers and distribution of the aphids depend on weather conditions. They are favoured by low temperature and high humidity. From a comparison of the data recorded by 20 meteorological stations in Uzbekistan for May and September during years in which outbreaks of *A. gossypii* occurred, the author concludes that the optimum conditions for its mass increase are a mean day and night temperature of about 20° C. (68° F.) and a relative humidity of about 60 per cent.

195. A PRELIMINARY NOTE ON THE BIONOMICS AND CONTROL OF THE BLACK-HEADED CRICKET (*Gryllulus domesticus*, LINN.) IN USTA COLONY (SIBI DISTRICT) OF BALUCHISTAN. By N. A. Janjua. (*Agr. and Livestock in India*, ix., 6, 1939, p. 688.) The Black-Headed Cricket (*Gryllulus domesticus*, Linn.) has caused considerable damage to several crops, including cotton, in the Usta colony, Sibi district, Baluchistan. Cotton was a complete failure in 1935-36 in spite of three or four sowings. The life-history, distribution, nature and extent of damage are discussed. The most effective control is by means of a poison bait consisting of rice or wheat bran, 20 seers; sodium fluosilicate, 1 seer; molasses, 1 seer; water to moisten. (1 seer=1.760 pints.) Baits must be fresh; those that are two or three days old are not eaten by the pest.

196. INVESTIGATIONS ON THE COTTON BOLLWORM, *Heliothis armigera*, HUBN. (*obsoleta*, FABR.). PT. I. ANNUAL MARCH OF BOLLWORM INCIDENCE AND RELATED FACTORS. By F. S. Parsons. (Reprinted from *Bull. Ent. Res.*, xxx., 3, November, 1939.) Methods for the quantitative survey of the incidence of *Heliothis armigera* have been in continuous operation in the Barberton area of the Eastern Transvaal from 1929 to the present; since 1933 the survey was operated similarly in Swaziland and Northern Natal. It was accepted early that the bollworm situation in cotton, which primarily it was desired to ameliorate, depends largely upon the influences exerted by other food-crops of the insect grown prior to and in association with cotton, and the investigations were instituted with a view to acquiring the fullest information on the incidence, habits and reactions of *H. armigera* with respect to the chain of cultivated and natural food-plant situations existing under differing climatic conditions in the course of the year. Data are given for five years' observation in concrete examples of situations in the environs of the Cotton Experiment Station, Barberton, the Cotton Station serving to represent the summer crop phase; the circumstances reported from these examples accord in all essential features with those applicable to the much wider areas under record. The close association of oviposition with the period of flower production on food-plants of *H. armigera* is emphasized. This association in conjunction with constancy in the interval, seeding-to-appearance-of-first-flowers, of cotton and maize, the predominant rain-grown crops, postulates when egg-laying on these crops may be expected to commence in quantity; data given for five years of widely differing planting dates evince the accuracy of forecasts so based. The heaviest bollworm attack of the cotton-growing season has fallen always within a month to six weeks from the commencement of flowering in maize and cotton. It is particularly important to minimize losses amongst the cotton fruit set within this period, as it contributes a high proportion of the crop yield, and measures for evasion and reduction of bollworm in cotton have been focussed accordingly. A preference of the moth to oviposit on maize has for long been utilized in diversion of moths from cotton at critical times, and the success of the measures is indicated in a figure displaying for five years the relative oviposition on crops of cotton and maize of variable acreage. Evidence obtained from studies of moth emergence serve to explain the yearly recurrence of the periodical oviposition witnessed. There is a remarkable similarity in the times of year at which moths from successive sources cease activity. The information supplies a clear indication of the origin of moths which occasion the initial infestation of cotton and other summer crops, and aids substantially in anticipating the arrival and duration of the first summer attack according to planting dates.

197. EFFECT OF TEMPERATURE AND MOISTURE ON OVER-WINTERING PUPÆ OF THE CORN EARWORM IN THE NORTH-EASTERN STATES. By G. W. Barber and F. F. Dicke. (*J. Agr. Res.*, 59, 10, 1939, p. 711.) Experiments conducted at

New Haven, Connecticut, and Arlington, Virginia, on the effect of moisture and temperature on hibernating pupæ of the corn earworm (*Heliothis armigera*, Hbn.) are discussed under the following headings: Hibernating Quarters of the Insect; Effect of Soil Temperature and Moisture; Effect of Submergence in Water; Comparative Winter Mortality of Pupæ resting on a Dry and on a Wet Medium; Effect of Availability of Air, of being embedded in Ice, of Earthworm Activity and of being embedded in Soil; and the Effect of Thermal Conductivity in Soils.

198. THE METABOLISM OF THE CORN EARWORM. II. GLYCOGEN AND MOISTURE. By L. P. Ditman and G. S. Weiland. (*Ann. Ent. Soc. Amer.*, **31**, 4, 1938. From *Exp. Sta. Rec.*, **81**, 5, 1939, p. 680.) A continuation of previous work.

[Cf. Abstr. 292, Vol. XVI. of this Review.]

199. THE OVER-WINTERING PUPA OF *Heliothis armigera*, HUBN. (*obsoleta*, FABR.) I. EFFECT OF TEMPERATURE AND MOISTURE. By E. Parry Jones. (*Brit. S. Afr. Co. Pubn.* 6, 1937. From *Exp. Sta. Rec.*, **81**, 1, 1939, p. 76.) A continuation of studies of the bollworm previously noted.

[Cf. Abstr. No. 636, Vol. XIII., 1936, of this Review.]

200. NOTES ON FOOD FOR CORN EARWORM ADULTS. By E. V. Walter and D. W. LaHue. (*J. Econ. Ent.*, **32**, 1, 1939. From *Rev. App. Ent.*, xxvii., Ser. A, **8**, 1939, p. 427.) In the course of investigations necessitating the rearing of larvæ of *Heliothis armigera* (*obsoleta*) during the winter, it was found that all the eggs laid by adults fed on a 10 per cent. solution of unfermented honey were infertile, whereas when freshly fermented dilute honey was used about 93 per cent. of the eggs were viable. There appeared to be no difference in the food value of honey fermented with baker's yeast or that in which fermentation had been caused by wild yeasts present in the air. However, the addition of baker's yeast gives quicker fermentation with less danger of invasion of undesirable fungous growths.

201. HIBERNATION OF THE CORN EARWORM IN SOUTHERN CONNECTICUT. By G. W. Barber. (*Bull. Conn. Agr. Exp. Sta. No.* 419, 1939. From *Rev. App. Ent.*, xxvii., Ser. A, **8**, 1939, p. 430.) An account of investigations carried out during 1935-38 in Connecticut and Massachusetts to determine whether the pupæ can over-winter successfully, previous experiments in southern Connecticut having given negative results. It was concluded that the insect survived the winter in certain environments in southern New England, at least during some years.

202. THE COTTON WORM (*Chloridea obsoleta*, F.) AND ITS CONTROL. By A. E. Rodd. (In Russian, with summaries in Uzbek and English.) (*Trud. sredneaz. Fil. nauchnoissled. Inst. Zash. Rast.*, **1**, p. 3, Tashkent, 1936. From *Rev. App. Ent.*, xxvii., Ser. A, **11**, 1939, p. 609.) Investigations carried out in 1935 near Tasikent in northern Uzbekistan, where tomatoes are cultivated on a large scale, and in Khairabad, in the south, where cotton is the chief crop, indicated that there were two complete generations a year, with a partial third and fourth, the life-cycle lasting about six weeks. The first generation larvæ occurred on tomatoes in both the areas investigated, but the later generations in Khairabad developed mainly on cotton. The adults bred in the laboratory from larvæ collected in the two districts showed considerable diversity of size and coloration, but no stable variations were observed. It is concluded, therefore, that the greater infestation of cotton in the south and tomatoes in the north is due to their greater availability and not to the occurrence of particular varieties or strains of the Noctuid. Infestation in 1935 was reduced by parasites of which the egg-parasite, restricted to the Tashkent district, was identified as a species of *Trichogramma*. The calcium arsenate bait applied to cotton is now stated to be 3 (and not 5) per cent. calcium arsenate.

[Cf. Abstr. 678, Vol. XIV. of this Review.]

203. EGG PARASITES OF THE COTTON FLEA HOPPER. By K. P. Ewing and H. J. Crawford. (*J. Econ. Ent.*, **32**, 2, 1939, p. 303. From *Rev. App. Ent.*, **xxvii.**, Ser. A, **10**, 1939, p. 538.) In June, 1936, 57 eggs of *Psallus seriatus*, Reut., suspected of containing parasites, were removed from *Croton* plants and isolated, and a Mymarid parasite emerged from each; 3 of these were identified as *Anaphes anomocerus*, Gir., and 54 belonged to the species subsequently described as *Erythmelus psallidis*, Gah. The latter species later emerged from eggs in *Croton* plants collected in Arizona, Arkansas, Louisiana, Mississippi, South Carolina and Texas, and the former from eggs in *Croton* plants from Arizona and Texas only. Of 41,947 eggs in the stems of various plants collected in 6 States during 1936 and 1937, 30.2 per cent. were parasitized. A list is given of the plants bearing eggs from which each species of parasite emerged. In most cases *E. psallidis* greatly predominated or was the only parasite present. Both species develop singly in a host egg. The adults of *E. psallidis* pair soon after emergence, the sexes occurring in approximately equal numbers. Emergence from eggs in field-collected plants usually took place by the 12th day, though 13-18 days were sometimes required. Two adults from eggs exposed to parasitism in the laboratory emerged on the 10th and 12th days. Anthocorids of the genus *Orius* were observed feeding on the adults in emergence cages. Two individuals of *E. psallidis* were reared from isolated over-wintering eggs, and 113 others emerged in the spring from eggs in plants that grew the previous season. This parasite was reared in small numbers from eggs on wild plants infested by Capsids other than *P. seriatus*, but evidently had a very definite preference for eggs of the latter.

204. THE RELATION OF WIND CURRENTS, AS INDICATED BY BALLOON DRIFTS, TO COTTON FLEA HOPPER DISPERSAL. By J. C. Gaines and K. P. Ewing. (*J. Econ. Ent.*, **31**, 6, 1938, p. 674. From *Exp. Sta. Rec.*, **80**, 5, 1939, p. 654.) In the studies reported catches on tall traps have shown that the adult cotton flea hopper is to be found in fairly large numbers from 21 to 26 feet in the air. "Collections made by airplane show adult flea hoppers as high as 2,000 feet above the ground. A heavy dispersal of flea hoppers into cotton in Calhoun County, Texas, from outside the area which was cleaned of *Croton* shows that dispersal of this insect is at least 20 miles. The prevailing wind currents in south-central Texas, as indicated by balloon drifts in 1937, are to the north and north-east from the light-soil areas toward the heavy-soil areas. One balloon drifted 155 miles at an average rate of 29.8 miles per hour. Twelve balloons found on the same day that they were released drifted an average of 62.4 miles at the rate of 13.3 miles per hour. The average drift of 346 balloons recovered from 3,334 releases was 42.6 miles." This has led the authors to conclude that adult flea hoppers may transfer long distances from their spring host plants, which grow abundantly in the light-soil area, to cotton and other native spring food plants in the heavy-soil areas, thereby accounting for the injurious infestations in large areas of cotton which are comparatively free of initial infestations of flea hoppers early in the spring.

205. NOTES ON THE BIOLOGY OF THE COTTON PRUNER (*Chalcodermus bondari*, MARSHALL). By L. Pyenson. (*J. Econ. Ent.*, **32**, 1, 1939. From *Rev. App. Ent.*, **xxvii.**, Ser. A, **8**, 1939, p. 413.) *Chalcodermus bondari*, Mshl., has been found damaging cotton throughout the State of Pernambuco, Brazil, as well as in Bahia and as far south as the Chaco region in Argentina. The weevils pass the day in young leaf-clusters and in the folds of wilted leaves on the cotton plants or on the ground under leaves or other debris. In addition to the leaves, petioles and young green stems of cotton, wild malvaceous plants and *Croton glandulosus* are also attacked. The females make a ring of punctures in young shoots, petioles or

flower stems and deposit an egg in the tissue just above it. The parts above the ring usually wilt and die, and young seedlings may be entirely killed. If the parts above the ring continue to grow no larvæ develop in them. Females have been observed to oviposit 1-5 times in a single night. The egg stage lasts about 3 days. The young larva bores up the stem, and when that part is hollowed, down below the ring. When it is full-grown, 12-18 days later, it bores out and drops to the ground, where it constructs a cell at a depth of about 2-4 inches and pupates after 4-5 days. The pupal stage lasts 6-7 days, and the adult remains in the soil for a further 5 days before becoming active. Oviposition begins when adults are about 3 weeks old. Injury appeared daily in a small isolated plot of cotton from February 26 to April 6, 1936, and again on May 5. Under dry conditions the larval period is prolonged. It is not certain whether there is a diapause in the dry season or continuous breeding in wild food-plants. The writer has reared from *C. bondari* two females of a Braconid of the genus *Urosigalphys* near *chalcodermi*, Wlksn., but thought to belong to an undescribed species, and an unidentified Chalcidoid. In laboratory tests a 0.5 per cent. suspension of lead arsenate was not effective against the adults, but Paris green at the same concentration gave almost complete kill in 24 hours. Spraying or dusting for the control of *C. bondari* alone is too expensive, but treatment might be combined with that for other pests, such as cutworms. Early in the dry season, all cotton plants should be destroyed and the field ploughed and left fallow, and all bushes and weeds in the immediate vicinity should be burnt.

206. O GAFANHOTO *Eutropidacris cristata*, L., NO NORTE DE MINAS. By J. B. de Medella e Silva. (*Bol. Minist. Agr. [Brazil]*, **27**, 7-12. Rio de Janeiro, 1938. From *Rev. App. Ent.*, xxviii., Ser. A, **1**, 1940, p. 9.) *Eutropidacris cristata*, L., caused damage to mango, orange, cassava, avocado, cotton, sugar-cane and rice in the north of Minas Geraes, Brazil, in 1937. It occurred in large numbers without forming swarms, and no mass flights were observed. Spraying and dusting with arsenicals are recommended, as well as a poison bait consisting of 100 lb. bran, 4 lb. white arsenic, 1.6 gals. molasses and 5.6 gals. of water.

207. THE FIELD CRICKET IN RELATION TO THE COTTON PLANT IN LOUISIANA. By J. W. Folsom and P. A. Woke. (*Tech. Bull. No. 642*, U.S. Dpt. of Agr., 1939. From *Rev. App. Ent.*, xxvii., Ser. A, **7**, 1939, p. 341.) This paper contains accounts of experiments and observations made from 1930 to 1933 on the bionomics and control of *Gryllulus* (*Gryllus*) *assimilis*, var. *pennsylvanicus*, Burm., attacking cotton in Louisiana. Detailed results are given of work on egg production and incubation periods, together with tables showing the measurements and durations of development of the nymphal instars and descriptions of all stages.

208. O PERCEVEJO *Horcius nobilellus* (BERG.) COMO NOVA PRAGA DO ALGODOEIRO EM S. PAULO. OBSERVAÇÕES PRELIMINARES. By E. J. Hambleton. (*Arg. Inst. Biol.*, **9**, p. 85, S. Paulo, 1938. With a summary in English. From *Rev. App. Ent.*, xxviii., Ser. A, **1**, 1940, p. 9.) *Horcius nobilellus*, Berg., a Capsid not previously recorded from the State of São Paulo, Brazil, has been observed in a number of cotton fields. A serious outbreak occurred in one district in 1937-38, causing a crop loss of some 25 per cent. in one plantation. Investigations indicated that the Capsid feeds on many plants, but prefers Malvaceæ, including *Sida cordifolia* and *S. rhombifolia*. Both nymphs and adults attack the terminal growths, squares, blossoms and immature bolls of cotton, and the damage results in excessive shedding of small squares and immature bolls and in a tendency to rather abnormal tall growth. In one infested field planted late in November, the average number of fruiting forms per plant dropped from 19.1 to 11.1 between March 30 and April 22, and the average crop loss was estimated

as at least 40 per cent. The adult of *H. nobilellus* is briefly described. Its distribution is not accurately known, but it probably occurs throughout southern and south-western Brazil.

209. COMPTE RENDUS DE LA V^e CONFÉRENCE INTERNATIONALE POUR LES RECHERCHES ANTIACRIDIENNES. (Minist. Colon., Brussels, 1938. From *Rev. App. Ent.*, xxvii., Ser. A, 9, 1939, p. 475.) Includes the summaries of 48 papers read at the Conference.

210. ON THE RESULTS OF BREEDING EXPERIMENTS WITH *Lygus lucorum*, MEY., ON COTTON AND EGG-PLANT. By I. Kawaai. (*J. Pl. Prot.*, 26, 6, Tokyo, 1939, p. 403. From *Rev. App. Ent.*, xxvii., Ser. A, 10, 1939, p. 555.) (In Japanese.) The experiments described were carried out at Okayama to determine whether a virus disease of cotton and egg-plant is transmitted by the Capsid *Lygus lucorum*, Meyer. Adults from diseased egg-plant in the field caused the symptoms on leaves of healthy cotton and egg-plant in 4 to 5 days. Transmission was effected by transferring even one adult, but in this case the resulting injury was not severe. Adults from diseased cotton transmitted the disease to healthy cotton in 3 to 5 days. Near Okayama the Capsids are present on egg-plant from late June to the end of August and in cotton fields from early July to the end of September. The feeding punctures on the leaves develop into small brown spots, as many as 506 of which were observed on a single leaf. Various Rhynchota of other families that occur in the cotton fields were tested for transmission; all gave negative results.

211. L'INFLUENCE DE LA TEMPÉRATURE ET DE L'HUMIDITÉ DE L'AIR SUR LE DÉVELOPPEMENT DU *Tétranyche* DU COTON. By R. E. Vasser. (In Russian, with summary in English.) (*Pl. Prot.*, No. 17, Leningrad, 1938. From *Rev. App. Ent.*, xxvii., Ser. A, 6, 1939, p. 313.) Laboratory observations indicate that the effects of temperature and humidity on cotton red spiders in the Russian Union are contradictory, especially in regard to humidity. They are, however, all based on field observations carried out in different areas, and apparently on different races or species of the mite. The author's experiments, which were carried out at temperatures of from 21 to 36° C. (69.8-96.8° F.) and relative humidities of 20 to 100 per cent., showed that the mite can adapt itself to a wide range of both factors, its rate of development being chiefly affected by temperature. High humidity (above 80 per cent.) is, however, detrimental to it, especially if combined with a temperature above 30° C. (86° F.) Mortality is lowest and egg production greatest at about this temperature and a relative humidity of 35 to 55 per cent., while development is completed in almost as short a time (7 to 9 days) as at a higher temperature.

212. OBSERVATIONS ON COTTON STAINERS IN THE WEST INDIES. By F. A. Squire. (Agr. Advisory Dpt., Imp. Coll. of Trop. Agr., Trinidad, 1939.) (In manuscript.) Discusses the distribution of *Dysdercus* species in the West Indies and records observations made in the Lesser Antilles. The host plants on which breeding takes place are enumerated and the nature of the association described. The series of alternative hosts bridging the periods from one cotton season to the next varies from place to place, and in some instances highly successful control of stainers has been simply achieved through interrupting the cycle by the eradication of one or two components of the local flora.

[Cf. E.C.G. REVIEW, Vol. XI., p. 99; and Abstrs. 487, Vol. III.; and 111, Vol. XIV.]

213. *Empusa dysderci* N. SP., UM NUOVO PARASSITA DE *Dysdercus*. By A. P. Viegas. (*J. Agron. S. Paulo*, ii., 4, 1939, p. 229. [English summary]. From *Rev. App. Mycol.*, xix., 3, 1940, p. 148.) A comprehensive account is given of the author's studies on a new species of *Empusa*, *E. dysderci* (a Latin diagnosis

of which is furnished), parasitic in São Paulo, Brazil, on *Dysdercus mendesi*, *D. ruficollis*, *D. honestus*, and *D. longirostris*, the nymphs of the first instar being particularly susceptible, adults relatively resistant, and eggs completely immune. Infected insects show no apparent signs of abnormality before death, which occurs suddenly and is followed by the luxuriant development of conidiophores covering the entire body with a white bloom, gradually turning chamois-coloured; mummification eventually ensues. The conidiophores are more or less cylindrical, smooth, hyaline, averaging 15 to 20 μ in diameter, simple when developing on the dorsal surface of the nymphs, branched on adults; they originate at the tips of the "hyphal bodies" or internal mycelium (17 to 58 μ in diameter) and reach the exterior of the insect through the integument, which is dissolved by enzymatic action. The primary conidia are roughly globose, smooth, hyaline, multinucleate, 35 to 46 by 30 to 40 μ , provided with a conspicuous basal papilla, and containing large oil drops; the secondary are similar but smaller. The zygospores produced in the interior of the tibial and tarsal regions and below the integument of the head are globose, elliptical, smooth, hyaline, and measure 50 to 60 μ in diameter. The mechanism of spore discharge in *E. dysderci*, which is positively phototropic, was ascertained to be analogous with that of *Pilobolus*, the conidia being transparent and acting as convergent lenses. A full description is given of the cytology of *E. dysderci*, which agrees with that of other species of the genus previously recorded. Pure cultures of the fungus were obtained only with great difficulty on insects autoclaved for 20 minutes at 120° C. Its pathogenicity was demonstrated by laboratory inoculation experiments on *D. ruficollis* and *D. mendesi*, in which up to 100 per cent. infection was obtained; but the value of the organism as a means of combating the cotton stainers in the field remains to be established by further investigations. The new species differs from the closely allied *E. apiculata* in the absence of rhizoids.

214. A OCORRÊNCIA DO ÁCARO TROPICAL *Tarsonemus latus*, BANKS (Acar. tarsonemidæ). CAUSADOR DA RASGADURA DAS FOLHAS NOS ALGODOAIS DE S. PAULO. By E. J. Hambleton. (*Arq. Inst. Biol.*, 9, p. 201, S. Paulo, 1938. With a summary in English. From *Rev. App. Ent.*, xxviii., Ser. A, 1, 1940, p. 11.) Of the mites that infest cotton in S. Paulo the most important is *Tarsonemus latus*, Banks, all stages of which are described. It breeds rapidly, only 3 to 5 days being required for the development of a generation, and is most abundant and injurious during the warm, rainy season. It feeds almost exclusively on the lower surfaces of the leaves, which become rigid and rolled under at the edges, and later split or crack open, assuming a ragged appearance. Dusting with finely powdered sulphur is recommended for control.

215. TERMITES IN SOUTH AFRICA. (*Ann. Rpt. of Dpt. of Agr. and For.*, 1938-39. From *Farmg. in S. Afr.*, December, 1939, p. 537.) Extensive further work has been done in connection with harvester termites, *Hodotermes* spp. It has been proved that in heavily infested areas there may be as many as 12,600 harvester-termite holes per morgen. Baiting with sweetened arsenite of soda applied to finely cut grass continues to give very satisfactory results. The practical value of such control is reflected in the fact that all baited camps have an excellent grass cover, whereas all unbaited camps, irrespective of the manner in which they are grazed, are characterized by large bare patches.

216. LABORATORY EVALUATION OF SOIL POISONS USED IN TERMITE CONTROL. By G. L. Hockenyos. (*J. Econ. Ent.*, 32, 1, 1939. From *Rev. App. Ent.*, xxvii., Ser. A, 8, 1939, p. 422.) A simple method of evaluating termite soil poisons in the laboratory is described, and a few characteristic results are given. The method consists of pouring 40 gm. soil into glasses containing crumpled tissue paper and 15 c.c. water. The glasses are 3½ inches high and have an inside

diameter of 2 inches at the top and $1\frac{1}{2}$ inches at the bottom. The poison is added to either the soil or the water before they are put together. When the soil is thoroughly moist, 15 to 25 worker termites are placed on the surface. The termites invariably entered the soil in the control glasses in a few hours. Trichlorobenzene and polychloropentane were shown to be much superior to the orthodichlorobenzene now commonly recommended. Sodium arsenite and sodium arsenate were the best of the inorganic compounds tried. Sodium pentachlorophenate was highly toxic and repellent, but seemed to be easily removed from its water solution by the soil.

217. THE EFFECT OF THRIPS INJURY ON PRODUCTION IN COTTON. By R. K. Fletcher and J. C. Gaines. (*J. Econ. Ent.*, **32**, 1, 1939. From *Rev. App. Ent.*, xxvii., Ser. A, **8**, 1939, p. 413.) In 1934 an investigation was undertaken in Texas to determine the extent of loss of cotton attributable to thrips. The nature of the damage is described. An intensive study was made of severe injury in one field in which only *Frankliniella tritici*, Fitch, was present. When the cotton was chopped between May 10 and 17, none of the plants was observed to be dead, but many died during the last fortnight of May. In a plot in the centre of the field 64 per cent. of the plants were injured before picking. These produced 232 lb. seed cotton per acre, while the normal plants produced 332 lb. The loss per acre calculated from this is 358 lb. Bolls matured much earlier on normal than on injured plants, and 1 lb. seed cotton was produced by 118 bolls from normal plants and 134 from injured ones. In 12 bottomland fields on light, sandy and heavy soils the percentages of plants injured varied from 10.67 to 57. The estimated loss in seed cotton per acre in these fields varied from 43 to 230 lb., with an average of 107 lb., and in two upland fields was 39 and 83 lb. The average numbers of bolls per plant produced on 324 normal and 192 injured plants were 5.73 and 4.56 respectively. The injured plants produced bolls 10 to 14 days later than the normal ones.

218. ELEMENTS OF PLANT PATHOLOGY. By I. E. Melhus and G. C. Kent. (Macmillan and Co., New York, 1939. From *Exp. Sta. Rec.*, **81**, 4, 1939, p. 523.) In this textbook the emphasis is placed on parasitism in disease processes and the principles relating to control measures, coupled with the condensation and omission of unnecessary morphological and mycological data. The objectives in choosing material were to meet the minimum needs in leading the student to appreciate the influence of plant pathology on human affairs, to acquire an understanding of health and disease in plants, to understand the phenomena of parasitism, and to acquire as much information as possible about the characteristics of diseases, their symptoms, causes and control. Following the introduction, there are chapters on plant pathology and human affairs, the development of plant pathology, disease in plants, parasitism, the influence of environment on plant diseases, and the principles of control measures. With respect to specific diseases, nine chapters deal, respectively, with diseases caused by Phycomycetes, bacteria, viruses, Ascomycetes, Fungi Imperfecti, Basidiomycetes, seed plants, nematodes, and non-parasitic agents. A glossary, a bibliography, and an index are provided.

219. IDENTITY OF TWO IMPORTANT PARASITES HITHERTO CONSIDERED AS DISTINCT SPECIES. By K. B. Lal. (*Curr. Sci.*, **8**, 3, Bangalore, 1939, p. 125. From *Rev. App. Ent.*, xxvii., Ser. A, **11**, 1939, p. 575.) In view of the difficulty in distinguishing *Microbracon lefroyi*, D. and G., which parasitizes *Earias* spp. and *Platyedra gossypiella*, Saund., on cotton in India, from *M. greeni*, Ashm., an important parasite of *Eublemma amabilis*, Moore, and *Holcocera pulverea*, Meyr., which are predaceous on the lac insect, *Laccifer lacca*, Kerr., examples of the two Braconids were compared. There was no constant morphological character

by means of which they could be distinguished, but as they do not usually oviposit on the same host it is considered that *lefroyi* is a race of *M. greeni*.

220. TWO EGG PARASITES OF THE COTTON BOLLWORM, *Heliothis armigera*, HUBN., (*obsoleta*, FABR.) IN SOUTHERN RHODESIA. By E. Parry Jones. (*Brit. S. Afr. Co. Pubn.* 6, 1937. From *Exp. Sta. Rec.*, **81**, 1, 1939, p. 76.) Investigations conducted with two of the indigenous egg parasites of the bollworm in Southern Rhodesia, *Telenomus ullyetti*, Nixon, and *Trichogramma lutea*, Gir., are reported.

221. TESTS OF *Trichogramma evanescens*, W., FOR THE CONTROL OF THE COTTON BOLLWORM (*Chloridea obsoleta*, F.). By L. M. Ponomareva. (*Summ. of Sci. Res. Work of the Inst. of Pl. Prot.*, 1936, Pt. III., Leningrad, 1938. From *Rev. App. Ent.*, xxvii., Ser. A, **6**, 1939, p. 304.) Investigations in Azerbaijan are described in which *Trichogramma evanescens*, Westw., was released against *Heliothis armigera* (*obsoleta*) on cotton on experimental plots $2\frac{1}{2}$ acres in area on September 26 and 29, 1936, during a period of intense oviposition by the moth. The mean temperature varied from 16 to 21.5° C. (60.8 to 70.7° F.) and the relative humidity from 55 to 77 per cent. Examination of the plants about a week after the release of the parasite showed that in plots in which the adults had been liberated at the rate of 300,000 per plot on the two dates, respectively, 71.3 and 76.7 per cent. of the eggs of the moth were parasitized; and in plots in which 300,000 and 100,000 parasitized eggs had been exposed on cards, the percentages of parasitism were 60.4 and 83.6, and 67.8 and 73.1, respectively. Since the chief damage to cotton is caused by the third generation of *Heliothis* in July, the parasite should be released at the rate of 120,000 per acre when the second generation adults are present in the field.

222. TWO NEW CHALCIDOID EGG PARASITES (EULOPHIDÆ AND MYMARIDÆ). By A. B. Gahan. (*Ent. Soc. Wash. Proc.*, **39**, **9**, 1937, p. 266. From *Exp. Sta. Rec.*, **79**, 6, 1938, p. 663.) *Tetrastichus silvaticus*, reared from the eggs of the forest tent caterpillar in Minnesota, and *Erythmelus psalidis*, a parasite of the eggs of the cotton flea hopper in Louisiana, South Carolina, Mississippi, Arkansas, Texas, and Arizona, are described as new.

223. A PARASITE OF *Sylepta derogata*, FAB. By C. Moriyama. (*Bot. and Zool.*, **7**, 6, Tokyo, 1939, p. 1124. From *Rev. App. Ent.*, xxvii., Ser. A, **10**, 1939, p. 557.) (In Japanese.) A description is given of the adult of a species of *Eulophus* that parasitizes the larvæ of *Sylepta derogata*, F., on cotton in Japan. A single host contains 20 to 40 parasites. The pupal stage lasts a week, and females, which are more numerous than males, live for a fortnight.

224. BELGIAN CONGO: COTTON DISEASES IN 1938. (*Rapp. Ann. pour l'Exercice*, 1938. Pt. I. From *Rev. App. Mycol.*, xix., **2**, 1940, p. 72.) The organism causing cotton wilt at Bambesa was identified at Baarn as *Fusarium vasinfectum*. Other fungi attacking cotton were *Alternaria macrospora* and *Rhizoctonia* (*Corticium*) *solani*. At Gandajika infection of cotton by *Nematospora coryli* and *N. gossypii* averaged 22 per cent. Evidence was obtained that the disease (stigmatomycosis) can be transmitted by *Antestia cincticollis*.

225. A DISEASE OF THE CORN EARWORM, *Heliothis obsoleta*, F. By N. Stahler. (*J. Econ. Ent.*, **32**, 1, 1939. From *Rev. App. Ent.*, xxvii., Ser. A, **8**, 1939, p. 423.) Laboratory rearing of *Heliothis armigera* (*obsoleta*) in California has been complicated in recent years by a larval disease causing usually not less than 10 and sometimes as much as 100 per cent. mortality. An infected larva acquires a metallic lustre, ceases to feed, becomes paralysed and dies in 1-3 days. When it dies, the cuticle blackens and becomes soft and sticky, and can be pulled apart by slight tension, allowing the liquefied contents to flow out. The symptoms

are those of a wilt disease, but no polyhedral bodies have been seen. The disease first attacked larvæ in the sixth instar, then progressively younger ones in succeeding generations, until it became difficult to rear them beyond the third instar. No first-instar larvæ and few of the second instar have been observed to die of the disease. Mortality is higher on lettuce or lucerne than on tomato fruit or maize meal.

226. OVERZICHT VAN DE BELANGRIJKSTE CITRUS-ZIEKTEN IN NEDERLANDSCH-INDIE. (A SURVEY OF THE MOST IMPORTANT CITRUS DISEASES IN THE DUTCH EAST INDIES.) By H. R. A. Muller. (*Meded. alg. Proefst. Landb.*, 34, Batavia, 42 pp., 29 figs., 1939. English summary. From *Rev. App. Mycol.*, xviii., 1939, pp. 794-6.) *Nematospora coryli* was found to be transmitted by the bugs *Rhynchochoris serratus*, *Leptoglossus membranaceus*, and *Cappæa taprobanensis*. Even after only one feeding on diseased fruits immediately following hatching most of the larvæ of *R. serratus* and *C. taprobanensis* retain their infective capacity throughout life, irrespective of successive moultings. It is therefore conjectured, though not definitely known, that the fungus is harboured in the intestines of the insects. *R. serratus*, fed once on diseased fruits and daily thereafter on healthy ones, was still infective after 65 days. *L. membranaceus* also conveyed *N. coryli* to tomato and *Cyphomandra betacea* fruits both in laboratory and field tests.

227. DISEASES OF COTTON IN NORTH CAROLINA. (61st Ann. Rpt. of North Car. Agr. Exp. Sta. for Fiscal Year ending June 30, 1939. Progress Rpt. for Year ending Decr. 1, 1938. From *Rev. App. Mycol.*, xviii., 12, 1939, p. 787.) S. G. Lehman enumerates the following as the most frequent seed-borne pathogens of cotton: *Glomerella gossypii*, *Fusarium moniliforme* (*Gibberella fujikuroi*), *F. sp.*, *Pythium*, and *Rhizoctonia* (*Corticium solani*), the two first-named predominating on seedlings from untreated seed not over one year old, the two last on those from treated or older seed, and *F. sp.* being common on both. Of the various chemicals tested for the control of seed-borne fungi, new improved cerasan was the most effective, while promising results were also given by cerasan, cuprocide, barbak C, sanoseed, and stercide; in one experiment the increases from seed treatment with cerasan and sanoseed were 45.8 and 39.8 per cent. respectively. Cerasan also proved very efficacious in the control of sore shin (*C. solani*), which was more prevalent on one-year-old than on two-year-old seed. The same preparation greatly reduced the incidence of *Bacterium malvacearum* on the cotyledons.

228. GROWTH OF FUNGI IN SYNTHETIC NUTRIENT SOLUTIONS. By R. A. Steinberg. (*Bot. Rev.*, vi., 1939, p. 327. From *Rev. App. Mycol.*, xviii., 12, 1939, p. 813.) The author sums up the available information on the carbon, nitrogen, mineral, and some organic requirements for the growth and reproduction of various fungi in culture on the basis of the pertinent literature.

229. DEPARTURES FROM ORDINARY METHODS IN CONTROLLING PLANT DISEASES. By N. E. Stevens. (*Bot. Rev.*, 4, 1938, 12, p. 677. From *Exp. Sta. Rec.*, 80, 4, 1939, p. 496.) Discusses among other methods the freeing of cotton seed from anthracnose by storage.

230. SOIL FUNGI AND ROOT INFECTION: A REVIEW. By A. Burges. (*Broteria*, viii. [xxxv.], 2, 1939, p. 64. From *Rev. App. Mycol.*, xviii., 11, 1939, p. 708.) In this critical review of the present knowledge of soil fungi the author discusses the occurrence of fungi as spores and mycelium in the soil, the number of fungi present, and the biologic groups of fungi represented.

231. ANGULAR LEAFSPOT OF COTTON IN IRRIGATED VALLEYS OF ARIZONA AND NEW MEXICO. By C. J. King and R. B. Parker. (*Pl. Dis. Rptr.*, xxiii., 2, 1939,

p. 32. Mimeographed. From *Rev. App. Mycol.*, xviii., 8, 1939, p. 520.) Investigations into the reason for the recurrence of cotton angular leafspot (*Bacterium malvacearum*) to a damaging extent in parts of Arizona and New Mexico, even when the rainfall was light and disease-free seed had been planted, showed that rapid spread resulted from the flow of irrigation water applied before volunteer "carriers" had been removed.

232. THE GENETICS OF BLACKARM RESISTANCE. I. FACTORS B_1 AND B_2 . By R. L. Knight and T. W. Clouston. (Reprinted from *J. of Genetics*, xxxviii., 1 and 2, 1939.) Varying degrees of resistance to blackarm (*Bacterium malvacearum*, Sm.) were found in American cottons, and complete immunity obtained in some, though not in all, of the Old World types. All Sakels tested showed the same susceptibility. "Resistance," except where otherwise stated, is used in the sense of resistance of the leaf and does not refer to the resistance of either stem or boll, nor to the ability of a plant to recover from a blackarm attack. The technique by which plants were given an equal chance of becoming infected is outlined, and a system of grading the intensity of blackarm attack on leaves is defined and illustrated. The inheritance of blackarm resistance was investigated in a cross between Nye's Uganda B31, a blackarm-resistant American Upland strain, and two strains of Sakel bred in the Sudan—X1530 and NT2. The F_1 of B31 \times Sakel was nearly as resistant as B31. The first Sakel backcross gave a 1 : 3 ratio of fully susceptible plants to others showing varying degrees of resistance. Resistant plants were further backcrossed and 1 : 3 ratios were obtained in the second and third backcrosses. In the third backcross 1 : 3 and 1 : 1 ratios were obtained according to the resistance of the parent selected for backcrossing. A straight F_2 gave a 1 : 15 ratio of fully susceptible plants to others showing varying degrees of resistance. F_2 's of the first, second and third backcrosses gave either 1 : 15 or 1 : 3 ratios according to the degree of resistance shown by the parent. Two factors have been isolated and named B_1 and B_2 respectively. They are dominant and cumulative. Each factor gives a typical form of resistance when added to the Sakel genotype and each is separately illustrated. Leaf and stem resistance are shown to be positively correlated. It is shown that B_1 and B_2 impart greater resistance to the Uganda B31 genotype than to the Sakel. This is attributed to the presence of modifying factors in Uganda B31.

[Cf. E.C.G. Review, Vol. VI., pp. 124, 308; IX., p. 276; X., p. 92; XI., pp. 188, 301; and Abstrs. 124, Vol. XIV.; and 124, Vol. XVI.]

233. EFFECT OF SULPHURIC ACID TREATMENT ON FUNGI AND BACTERIA PRESENT ON COTTON SEED FROM DISEASED BOLLS. By D. C. Bain. (*Phytopathology*, xxix., 10, 1939, p. 879. From *Rev. App. Mycol.*, xix., 2, 1940, p. 89.) Fewer fungi, including *Sordaria* (most commonly), *Diplodia natalensis*, *Fusarium moniliforme* (*Gibberella fujikuroi*) and *F. oxysporum*, and bacteria were isolated on potato dextrose agar from some 8,000 delinted cotton seeds from bolls infected by *Bacterium malvacearum* after 45 and 60 minutes' immersion in concentrated sulphuric acid than following shorter periods (15 and 30 minutes) of treatment, the average percentages from floating and sinking seeds for the 15-, 30-, 45-, and 60-minute dips being 37 and 11.9, 37.6 and 27, 29 and 12.2, and 14.2 and 16.1 respectively. The average germination of sinking seeds, as well as their health, was superior to that of floating material (90 as compared with 73.8 per cent.). An additional treatment of half the seeds in a 1 in 1,000 mercuric chloride solution in 50 per cent. alcohol did not appreciably affect either their fungal content or germinability. In a special test of 400 seeds treated in sulphuric acid for an hour and dissected aseptically, three colonies of *B. malvacearum* were recovered from the seed coat and two from the embryo. All these cultures

produced definite angular leaf-spot lesions on young cotton plants sprayed with suspensions of them.

234. THE MILDEW TROUBLE IN TEXTILES. (*Text. Wkly.*, xxiv., 1939, pp. 457 and 488.) A discussion of the origin, history and major causes of mildew, and of the merits and demerits of various antiseptics used for counteracting its effects.

235. STUDIES ON THE ROOT-ROT DISEASE OF COTTON IN THE PUNJAB. VII. FURTHER INVESTIGATION OF FACTORS INFLUENCING INCIDENCE OF THE DISEASE. By R. S. Vasudeva and M. Ashraf. (*Ind. Jour. Agr. Sci.*, ix., 4, 1939, p. 595.) The bearing of temperature and humidity on the incidence of root-rot disease of cotton has been shown. Preliminary observations indicate that a virulent attack of the disease may be evaded by sowing cotton in mixture with sorghum. There is no difference in the texture and chemical composition of healthy and diseased soils except that the diseased soils contain a higher amount of acid-soluble calcium and have a higher Ca : Mg ratio. There is no correlation between the hydrogen-ion concentration of the soil and the incidence of the disease.

[Cf. Abstrs. 307, Vol. XIII; 127, 711, Vol. XIV.; 139, Vol. XV.; 509 and 709, Vol. XVI. of this Review.]

236. ROOT-ROT IN THE PUNJAB. (*Ann. Rpt. of Ind. Cent. Cott. Comm.*, 1938. From *Rev. App. Mycol.*, xix., 1, 1940, p. 15.) In a note on the Punjab root-rot scheme it is stated that infection by *Rhizoctonia bataticola* (*Macrophomina phaseoli*) and *R. (Corticium) solani* starts on the cotton crops of both native and American varieties at an age of 6 to 8 weeks (end of June). The 83A.F. variety was comparatively resistant in 1938, when the incidence of disease was abnormally high. Of 88 strains tested at the Parbhani (Hyderabad) Cotton Research Station, 26 showed a fair degree of field resistance to wilt (*Fusarium vasinfectum*). Six out of 11 strains tested at Latur also proved fairly resistant. There is a great demand for the wilt-resistant *Gossypium neglectum verum* 434, a selection from 262, which is hardy, prolific, and excellent for spinning.

237. THE PATHOGENIC ACTION OF *Phymatotrichum omnivorum*. By G. M. Watkins and M. O. Watkins. (*Science*, N.S., xc., 2338, 1939, p. 374. From *Rev. App. Mycol.*, xix., 3, 1940, p. 147.) When pure cultures of *Phymatotrichum omnivorum* were maintained in successive transfers on roots of living cotton seedlings, and a fragment of infected root was placed against the root of a healthy seedling, shrinking and discoloration of the tissues of the healthy seedling adjacent to the piece of infected root generally resulted. This was followed by the development of an encircling and penetrating hyphal web, which in two or three weeks produced a soft rot of the cortex along the whole root system. Direct application of drops of liquid squeezed from affected roots was made on to the surfaces of normal cotton seedling roots, healthy roots in a parallel series being treated with drops expressed from diseased roots subjected to the temperature of boiling water for one hour, while similar tests were conducted with liquid expressed from germinating sclerotia. The results obtained showed that the liquid from the unheated, decayed roots was absorbed by healthy roots in 4 or 5 hours, and frequently imparted a water-soaked appearance to the tissue at the points of application. This affected tissue shrank, turned yellow or light brown, and formed sunken, necrotic areas, which girdled the root almost to the central cylinder; finally, the epidermis and cortex collapsed into a deeply staining, disorganizing mass, while abundant cell division in the pericycle initiated the formation of lateral roots. In the roots treated with liquid from heated decayed roots only a slightly discoloured spot formed, and there was no considerable shrinkage or disruption of tissue continuity, though toxic effects were exerted on protoplasts near the site of application. The experiments with

unheated and heated liquid from germinating sclerotia gave results comparable with the foregoing. Further evidence indicated that viable hyphæ were seldom, if ever, transferred with the drops, and that the lesions that developed were due to fungal secretions.

238. GIRDLING OF COTTON PLANTS AS AFFECTING SURVIVAL OF *Phymatotrichum omnivorum*. By W. N. Ezekiel. (Abs. in *Phytopathology*, xxix., **8**, 1939, p. 753.) From *Rev. App. Mycol.*, xix., **1**, 1940, p. 14.) In preliminary experiments (in Texas) suggested by the work of R. Leach on *Armillaria mellea*, cotton plants girdled on July 29, 1938, developed bronzing of the foliage within 11 days, and a third of the total were dead in less than a month. The necrotic process coincided with a rapid decrease of alcohol-soluble solids and total sugars in the roots. *Phymatotrichum omnivorum* was not recovered in a viable form from the roots of girdled plants after 3, 5, or 8 weeks, whereas the fungus readily developed from those of the untreated controls. In another test started on September 3, girdling failed to produce any change in the aerial organs of cotton plants or to impair the viability of *P. omnivorum* on the roots, the effects of girdling being apparently associated exclusively with the period of rapid growth of the host.

239. UNUSUAL FEATURES IN THE BEHAVIOUR OF SCLEROTIA OF *Phymatotrichum omnivorum*. By J. T. Presley. (*Phytopathology*, xxix., **6**, 1939, p. 498. From *Rev. App. Mycol.*, xviii., **10**, 1939, p. 674.) In contrast to the sclerotia produced by many fungi, those of the cotton root-rot fungus, *Phymatotrichum omnivorum*, seem capable of reproducing the fungus from every cell by a process of "vegetative sprouting." The new hyphæ appear to be formed inside the cells, whose contents go through a process of disorganization and reorganization that results in the formation of new hyphæ, each of which can produce a mycelium. The following is the sequence of events within the cells: Complete nuclear disorganization is succeeded by the convergence of two of the dark-staining bodies (possibly nucleoli) scattered throughout the cells, coinciding with localized increased density of the cytoplasm and ultimately giving rise to the formation of hyphæ, which break through the "mother" cell wall. Some of the hyphal tips on emergence from the sclerotial shell have peculiar branches or appendages which soon become detached. The newly formed hyphæ are multinucleate and agree in all particulars with those of the actively growing vegetative mycelium, imparting to the sclerotium the setose aspect typical of the germinating stage of the fungus.

240. SOBRE A NATUREZA DA RAMULOSE OU SUPERBROTAMENTO DO ALGODOEIRO. (ON THE NATURE OF RAMULOSIS OR EXCESS BUDDING OF COTTON). By A. S. Costa and C. G. Fraga. (*J. Agron. São Paulo*, ii., **3**, 1939, p. 151. With English summary. From *Rev. App. Mycol.*, xviii., **12**, 1939, p. 798.) A cotton disease in São Paulo, previously described by the authors in *Bol. Tec. Inst. Agron., Campinas*, 29, 1937, as "excess budding," or "ramulosis," the cause of which was obscure, is now tentatively attributed to a new variety of *Colletotrichum gossypii*, referred to as var. *cephalosporioides* (without a diagnosis). This variety closely resembles *C. (Glomerella) gossypii* in its morphological characters, and may, in fact, be merely an exceptionally aggressive form of the anthracnose fungus. The two organisms, however, besides differing culturally, show marked divergences in pathogenicity towards the Barberton C.96 and Gatooma varieties of *Gossypium hirsutum*. Thus, in an inoculation test on 40 Barberton plants with spore suspensions of both fungi, *C. gossypii* var. *cephalosporioides* infected 16 and *G. gossypii* none, while in four trials on Gatooma the former gave positive results in 34 out of 36, 13 out of 14, 7 out of 15, and 15 out of 15 cases, while the latter was uniformly unsuccessful in inducing the typical symptoms of the disease.

241. THE OCCURRENCE OF THE PERFECT STAGE OF *Rhizoctonia solani* IN PLATINGS OF DISEASED COTTON SEEDLINGS. By A. J. Ullstrup. (*Phytopathology*, **29**, 4, 1939. From *Exp. Sta. Rec.*, **81**, 1, 1939, p. 55.) Basidia, sterigmata, and basidiospores identified as those of *Corticium vagum* developed in platings with mycelium of *R. solani* from diseased cotton seedlings. The complete life-cycle was obtained only when multispore transfers were used to seed plates of tap-water agar.

242. AN INTERNAL COLLAR ROT ON COTTON. By C. J. King and H. D. Barker. (Abs. in *Phytopathology*, xxix., **8**, 1939, p. 751. From *Rev. App. Mycol.*, xix., **1**, 1940, p. 14.) A fungus characterized by dark brown, multiseptate chlamydospores and endogenous cylindrical spores, and apparently identical in all morphological characters with *Thielaviopsis basicola*, is the agent of a hitherto unreported root-rot of cotton, manifested by a purplish-black discoloration of the infected tissues, which has been observed in the Sacaton district of Arizona for several years. The disease causes heavy mortality among seedlings when the soil is cold and wet, and a relatively quiescent period during the hot weather is followed by renewed activity in the late summer. Inoculation experiments with *T. basicola* resulted in the typical symptoms of the rot (except for the death of mature plants), the fungus being recovered in culture. American-Egyptian varieties are more susceptible than Upland. *T. basicola* persists in the soil for years, but its rate of spread is slow.

243. STEM BREAKING OF COTTON. By J. F. Dastur. (*Agr. and Livestock in India*, ix., **6**, 1939, p. 685.) *Summary*: A stem-breaking disease of cotton is described. It occurred in an epidemic form in Majrod Khurd village, Nimar district, Central Provinces. The direct cause appears to be the prolonged blowing of wind at high velocity. The plants were not able to withstand this because at the time they were top-heavy due to the development of a luxurious foliage resulting from early sowing in highly manured fields.

244. PLANT PATHOLOGY. (*Arkansas Sta. Bull.* 368, 1938. From *Exp. Sta. Rec.*, **80**, 6, 1939, p. 780.) Progress reports are included on studies of the genetics, physiology, and pathology of cotton, with special reference to wilt and the breeding of wilt-resistant varieties (V. H. Young *et al.*); physiology and pathology of biological strains of the cotton-wilt fungi (Crailey); the etiology and control of seedling blights and boll rots of cotton (Young).

245. LA FUSARIOSE OU WILT DU COTONNIER. By A. Brixhe. (*Bull. Trim. du Com. Cotonn. Congolais*, iv., **14**, 1939, p. 49.) A general account of the disease in relation to its appearance in the Belgian Congo. Concern is expressed at the possibility of its development to a serious degree.

246. VASCULAR DISEASES OF COTTON IN UGANDA. By C. G. Hansford. (*E. Afr. Agr. J.*, January, 1940, p. 279.) This group of diseases has become more prevalent in Uganda during the last ten years. The organisms capable of attacking the present standard Uganda cotton varieties are *Verticillium dahliae* and a number of strains of the *Elegans* section of the genus *Fusarium*. During the past two years preliminary work has been done towards the determination of the host range of the fungi associated with wilt disease of cotton. The present laboratory work is directed towards the isolation of wilt organisms and the testing of each on a wide range of crop plants grown in Uganda, to be followed by tests on common weeds, as some of the latter have been found infected in the field. It is hoped by this means to determine what plants can be grown safely in rotation with cotton. No cotton variety immune or very highly resistant to wilt disease in Uganda has yet been discovered, but the present range of varieties shows differences in susceptibility: B.P.50 is more susceptible than the standard "Buganda Local" and B.181 is less susceptible than either.

Selection for resistance is complicated by market considerations; for instance, B.181 is more resistant to wilt and to blackarm than many other varieties, but its lint does not come up to requirements. Some strains of cotton have been isolated at Bukalasa which shed their leaves after an acute attack by *Verticillium*, subsequently develop a flush of secondary foliage, and ripen their crop. Lint collected from such plants showed no deterioration in quality. Should it be found impossible to obtain highly resistant varieties suited to Uganda conditions, strains which are able to "recover" from attack may prove very valuable.

247. ATTEMPTS TO CONTROL VERTICILLIUM WILT OF COTTON AND BREEDING FOR RESISTANCE. By B. A. Rudolph and G. H. Harrison. (Abs. in *Phytopathology*, xxix., 8, 1939. From *Rev. App. Mycol.*, xix., 1, 1940, p. 14.) The heavy soils of the San Joaquin Valley, California, where cotton has been grown continuously for the last ten years, have become extensively (and in places totally) permeated by *Verticillium albo-atrum*, the selection of strains resistant to which has been successfully accomplished within the varieties Cooke 307-6, Mexican Big Boll, Kekchi, Tuxtla and Missdel. Strains of Stoneville and Acala, while not resistant, are prolific under heavy infection. The American-Egyptian types are highly resistant to *V. albo-atrum*, and an attempt is in progress to transfer the resistance of Pima to Acala by means of back-crossing.

248. SOME TESTS OF VARIETAL SUSCEPTIBILITY TO A COMBINATION OF ROOT-KNOT NEMATODE AND COTTON WILT. By L. E. Miles. (*Phytopathology*, xxix., 11, 1939, p. 974. From *Rec. App. Mycol.*, xix., 3, 1940, p. 146.) Of 17 varieties of Upland cotton grown on soil heavily infested with the root-knot nematode (*Heterodera marioni*) and wilt (*Fusarium vasinfectum*) at the Mississippi Agricultural Experiment Station, the highest degree of resistance to both organisms was shown by Cleve-wilt 6, Cook 144-68 and 307, Dixie Triumph 55-85, Toole (Perry), Sykes W. R., Dixie 14-5, and Dixie Triumph 12, the average percentage of fungal infection amounting to 18.53 as against 36.61 and 79.92 in the intermediate and susceptible groups respectively. Of 14 exotic varieties and hybrids, one strain of Sea Island (13B3) remained free from wilt throughout the experiment, while another (Andrews) showed 9.61 per cent. infection. Similarly, one strain of Hopi (Sacaton 6, No. 2) contracted only 9.73 per cent. infection, while another (M-34-6-2, No. 6) was 100 per cent. diseased. The average incidence of wilt in the resistant group of exotic varieties was 13.20 as against 87.18 in the susceptible. Except for Sea Island 13B3 all the foreign varieties were liable to nematode infestation, which was particularly severe in the wilt-susceptible group.

249. THE NOMENCLATURE OF PLANT VIRUSES. By G. C. Ainsworth. (*Chron. Bot.*, v., 2-3, 1939. From *Exp. Sta. Rec.*, 81, 4, 1939, p. 524.) A discussion with proposal of a system of designating virus types and strains.

250. VIRUS DISEASES OF PLANTS. By H. H. Storey. (*E. Afr. Agr. Res. Sta. Anni. Rpt.*, 1938, p. 13.) The present paper is a continuation of previous work, and discusses the mechanism of transmission by insects, virus diseases of maize, cassava, passion fruit, etc.

[Cf. Abstrs. 254, Vol. XI.; and 710, Vol. XV. of this Review.]

251. PHYSIOLOGICAL CHANGES IN VIRUS-AFFECTED COTTON. By L. Kara-Mourza. (*Virus Diseases of Plants*, Collection II. Pubd. Pan-Soviet Inst. Pl. Prot., 1938. From *Rev. App. Mycol.*, xviii., 10, 1939, p. 697.) In a study on cotton-leaf curl in Azerbaijan the dry weight of the infected plant averaged only 59 per cent. of that of the healthy plant, the number of bolls was reduced to 58.8 per cent. and the dry weight of the roots to 36.6 per cent. Diseased leaves are thicker than healthy ones (418 μ and 233 μ respectively), and often

form a second palisade layer on the upper side, but sometimes also on the lower side; leaf cells are very enlarged, and those of the veins and petioles contain large numbers of starch granules which are absent from healthy leaves. Transpiration is generally lower in diseased plants than in healthy ones, except in the evening, when it is often higher. The nitrogen content of the sap is higher than in healthy leaves.

GENERAL BOTANY, BREEDING, ETC.

252. THE APPLICATION OF ECONOMIC BOTANY IN THE TROPICS. By Sir Frank Stockdale. (*Bull. of Imp. Inst.*, xxxvii., 4, 1939, p. 546.) This paper, which was prepared for the British Association Meeting at Dundee in 1939, is a brief summary of the very considerable amount of work which is being carried on throughout the tropical Empire in the realm of economic botany. The various crops dealt with include coffee, sugar-cane, cacao, rubber, cinchona, banana, rice, cotton, sisal. In regard to cotton the author writes as follows: "No crop has received more scientific attention than cotton. The number of varieties is considerable, and their classification is a matter of difficulty. Wild types occur in both Asia and America and also in Australia and Polynesia, whilst the cultivated cottons fall into two definite groups—the Old and the New World cottons. The numerous varieties which are now cultivated are the products of selection. Growers themselves have played an important part in this work, but during the past thirty years scientific workers in Egypt, the Sudan, India, the United States and in various parts of the Colonial Empire have been responsible for marked advances. Reference need only be made here to the valuable work done by Balls, Bailey, Parnell, Harland and Mason. The work in the British Empire has been greatly assisted by the scientific officers of the Empire Cotton Growing Corporation. Selections for yield, improved lint length, fineness and strength of lint, and ginning outturn have all received attention, whilst much research into the general physiology of the plant and into the genetic constitution of the various forms has been carried out. Attention in recent years has been directed to the selection of types resistant to diseases and to insect pests. It is necessary here only to mention the success which has been achieved in the isolation of types by Parnell immune to jassid attack, and the development in the Sudan of forms resistant to leaf curl. The nature of the resistance has in every case been the subject of investigation, and not infrequently it has been found that this characteristic is the result of factors which enable the plant to establish a state of equilibrium with its environment."

253. EARTH'S GREEN MANTLE. By S. Mangham. (Pubd. The English Univ. Press Ltd., 1939, 10s. 6d. Reviewed in *Ann. of App. Biol.*, xxvi., 4, 1939, p. 849.) From this review we extract the following: "This is an excellent and unusually comprehensive survey of modern plant science written for the general reader. Although the author's choice of material and points of view are essentially those of a teacher of botany in an academic institution, he shows considerable sympathy with the more applied aspects, and it is interesting that in his final chapter headed 'Progress and Prospects' his viewpoints and material are entirely applied. The book opens with a foreword by Sir Arthur W. Hill, and closes with a somewhat unsatisfactory list of books suggested for further reading and an index. It is illustrated by 42 text figures and 40 plates, each of the latter containing from one to eight excellent photographs which, in many cases, suffer from over-reduction. The book is accurate, up-to-date, and interesting, for the author has performed his task well."

254. EASTERN ASIATIC COTTON: TAXONOMY. By Z. Onodera. (*Proc. Crop. Sci. Soc. Japan*, 10, 1938, p. 5. From *Summ. of Curr. Lit.*, xix., 19, 1939,

p. 558.) Various classifications of *Gossypium* species are reviewed, and that of Harland is said to accord best with the author's experience of cotton in Persia, India, Burma, Siam, Cochin China, Korea and Japan. The cotton widely cultivated in Eastern Asia is regarded as *G. arboreum* var. *neglectum* forma *burmanica*, H. and G. *G. herbaceum* does not occur in Eastern Asia.

255. PLANT BREEDING TECHNIQUE IN RECENT YEARS (LECTURES DELIVERED AT THE AGRICULTURAL RESEARCH INSTITUTE, NAGPUR). By R. H. Richharia. (Printed at the Bangalore Press, Mysore Road, Bangalore City, 1939, Rs. 2-8. Reviewed in *Pl. Bre. Absts.*, x., 1, 1940, p. 65.) The reviewer states that "in the short space of only 73 pages the author puts forward a remarkably clear outline of the theoretical bases of modern plant breeding. After a brief treatment of the mechanism of gene segregation and the standard methods of selection and 'recombination breeding' comes a section on distant hybridization and on the special methods used by the breeder to effect wide crosses—a treatment in which there is one notable omission, that of pollination in the bud stage. The rest of the book is devoted to what the author calls non-Mendelian methods of breeding—polyploidy and its induction by decapitation, the use of twin seedlings and treatment with abnormal temperatures and chemicals, and the production of new mutations by irradiation. A concluding chapter deals briefly with cytological technique. The book is to some small extent marred by insufficiently careful proof reading and by grammatical errors, and some of the definitions in the glossary at the end could be improved upon. The omission of the titles of papers in a bibliography is also unfortunate, though the practice is a common one. These, however, are criticisms of the details of presentation and not of the way in which the subject-matter has been selected and arranged."

256. RECENT ADVANCES IN GENETICS. By F. W. Sansoms and J. Philp. (J. and A. Churchill Ltd., London. 2nd edn. 1939. Price 18s. Reviewed in *Trop. Agr.*, xvi., 11, 1939, p. 261.) "Keeping up to date with the results of the latest researches is a difficult problem, even in so specialized a subject as genetics. In the most extensive reading it is easy to overlook an important paper, and regular reading of scientific journals is apt to result in a very disjointed picture of the subject as a whole. Such a book as the one under review has the great merit of co-ordinating recent literature so that papers advancing one particular branch of the subject are considered in their relation to each other. This is particularly important where our understanding of a problem is being advanced by investigations in widely different organisms, as, for example, *Drosophila* and maize. It would not be reasonable to expect such a book to be easy reading, and it deals with material too recent for the full effect on genetic theory to be clear. There are chapters dealing with the main sections of genetic theory, and in them the most recent facts are well presented. As might be expected, discussions and conclusions occupy a comparatively small part of the book, but they are valuable and, allowing for the fact that the work discussed is very recent, adequate. The reviewer would have liked to see a chapter devoted to quantitative inheritance and the application of genetics to plant breeding. Perhaps, when another edition is required, the advances in applied genetics will be sufficient to justify the devotion of a chapter to them."—J. B. H.

[Cf. Abstr. 286, Vol. X., 1935, of this Review.]

257. GENE SYMBOLS FOR USE IN COTTON GENETICS. By J. B. Hutchinson and R. A. Silow. (Reprinted from *J. Hered.*, xxx., 10, 1939.) A list of the cotton genes of which descriptions are available, with nomenclature adjusted in accordance with accepted genetic conventions, and with regard to the special circumstances obtaining in the genus. A list of 45 references to the literature is included.

258. THE GENETICS OF A PETALOID MUTANT IN COTTON. By M. Afzal and S. Singh. (*Ind. J. Agr. Sci.*, ix., **6**, 1939, p. 787.) Discusses a petaloid mutation, in which the stamens are more or less transformed into structures resembling petals, occurring in a pure strain of *Gossypium arboreum*.

259. APPLY THE THEORY AND METHODS OF WORK OF DR. T. D. LYSENKO TO WORK ON FLAX AND COTTON. By M. Poperekov. (*Len i Konoplja* [Flax and Hemp], **1**, 1939, p. 6. From *Pl. Bre. Absts.*, ix., **3**, 1939, p. 317.) A brief outline of work at the Odessa Institute for Breeding and Genetics in which Lysenko's views on variation in pure lines and the effect of environmental factors on the genotype are recounted, with observations on the applications of these theories in the work of the station.

260. SOME DETRIMENTAL TRENDS IN RUSSIAN GENETICS AND PLANT BREEDING. By S. Lewicki. (*Przegl. Doswiad. Roln.* [Rev. Agr. Res.], **1**, 1938, p. 261. From *Pl. Bre. Absts.*, ix., **4**, 1939, p. 398.) The author refers to the views of Lysenko and his school and points out that his conclusions are based on very inadequate experimental data and that many of the results support rather than invalidate the Mendelian laws. Experiments are being started at Pulawy to test his new technique of crossing and the method of "regeneration" of old varieties.

261. HERITABLE VARIATIONS CONDITIONED BY EUPLOID CHROMOSOME ALTERATIONS. By D. Kostoff. (*Chron. Bot.*, **5**, 1, 1939, p. 17. From *Exp. Sta. Rec.*, **81**, 2, 1939, p. 191.) Reasons are given why it appears desirable for investigators who attempt to produce polyploids for practical purposes (especially with colchicine and acenaphthene) to restrict their work chiefly to plants with small chromosome numbers and with short chromosomes.

262. THE PRODUCTION OF PLANTS WITH NEW CHARACTERS BY DOUBLING THE NUMBER OF CHROMOSOMES (POLYPLOIDY). By D. Kostoff. (*Rev. Bot. App.*, **19**, 1939, p. 81. From *Pl. Bre. Absts.*, ix., **3**, 1939, p. 287.) A study of nearly twenty species and hybrids with the doubled chromosome number shows that they can be divided into three groups: (1) with characters which increase in length according to the increase in chromosome number; (2) with characters which increase, diminish and do not change after duplication of the chromosome number; (3) with characters which as a rule do not change. Most polyploids fall into the first group; examples of the others are rare. The fertility of sterile hybrids is more or less completely restored. Notes are given on the use of colchicine and acenaphthene.

263. VIABILITY OF SEEDS OF COTTON AS AFFECTED BY MOISTURE AND AGE UNDER DIFFERENT METHODS OF STORING. By F. B. Flores. (*Philippine J. Agr.*, **9**, 4, 1938, p. 347. From *Exp. Sta. Rec.*, **81**, 3, 1939, p. 366.) Sun-dried cotton seed, whether delinted, ginned, or in seed cotton, when stored in airtight containers retained enough viability for planting purposes after 1 year in storage, while the same kind of seeds kept in burlap sacks were useless after 6 months in storage. Sun-dried and air-dried seed cotton maintained higher viability percentages than either ginned or delinted cotton seeds in practically all the tests as storage was prolonged. A definite relation was indicated between the moisture content of the seeds during storage and the rapidity of deterioration.

264. STUDIES ON THE CYTOLOGY AND CROSS-COMPATIBILITY OF SOME COTTON VARIETIES. By J. M. Capinpin and I. Khambanonda. (*Philipp. Agr.*, **29**, 1939, p. 163. From *Pl. Bre. Absts.*, x., **1**, 1940, p. 43.) Crosses were made or attempted between *Gossypium barbadense*, L. (Sea Island and Pima Egyptian), *G. punctatum*, Sch. et Thon. (Batangas White, Batangas Light Brown and Batangas Dark Brown), *G. paniculatum* Blanco (Ilocos Brown), and a wild cotton collected in the Philippines and provisionally ascribed to *G. obtusifolium*, Roxb.

The first four species were shown to be tetraploids ($2n = 52$), while the wild species was diploid ($2n = 26$). It was found that crosses between the tetraploids were successful, but no hybrids between these and the diploid species were obtained. No seeds were obtained from about 200 pollinations using the diploid wild species as male parent, while from the reciprocal crosses, involving 140 pollinations, only one sound seed was obtained, from the cross wild cotton \times Ilcos Brown; this seed failed to germinate. The F_1 hybrids between the tetraploid species had $2n = 52$.

265. ACETO-CARMINE SMEAR TECHNIQUE FOR COTTON CYTOLOGY. By D. Ganeshan. (*Curr. Sci.*, **8**, 1939, p. 114. From *Pl. Bre. Absts.*, ix., **3**, 1939, p. 271.) An account of an improved aceto-carminic smear technique which has given excellent results for cotton.

266. EXPERIMENTAL METHODS WITH COTTON. II. A STUDY OF THE EFFECTS OF SEED RATE AND TIME OF THINNING ON THE DEVELOPMENT AND YIELD OF COTTON PLANTS IN HAND-PLANTED COTTON TRIALS. By D. MacDonald, W. L. Fielding, and D. F. Ruston. (*J. Agr. Sci.*, xxix., **3**, July, 1939.) The object of this experiment was, in the first place, to see whether, with cotton experiments, there was an advantage in planting a larger number of seeds per hill than the customary number of three; and, in the second place, to see the effect of the interaction of time of thinning with varying numbers of seeds per hill. In cotton breeding work, where trials of new strains have to be carried out as soon as sufficient seed is available, it is important to conserve seed in all possible ways. At the same time it is necessary to plant sufficient seed to give a full and even stand for all strains. In experiments carried out in 1936-37 and 1937-38 stand counts, made soon after germination, showed the advantage of the higher seed rates in obtaining a quick and full stand. Later counts and final counts at harvest showed a considerable evening up, although the two-seed treatment proved unreliable, giving the lowest stand in both seasons. Plant height and weight records, made during both seasons, showed that plants from the larger hills were drawn up much more rapidly than plants from the smaller hills. This rapid elongation in stem height proved, from weight figures, to be at the expense of lateral development, weak and leggy plants being produced in these hills. The ten-seed treatment showed up particularly badly in this respect, the yield figures showing that the plants never recovered from this early deleterious effect. The six-seed treatment, whilst giving a quick and excellent stand, suffered to a certain extent from the same defects as the ten-seed treatment. If thinned early they tended to fill out and become more comparable with plants from the three-seed treatment, but when thinning was delayed they never caught up and final yield suffered adversely. In both years the three-seed treatment proved the most reliable, its stand being very little inferior to that produced by the six-seed and ten-seed treatments. Before thinning the two extra seedlings were not sufficient to cause any very marked elongation in stem height, or to retard general development through competition. The seedlings were strong and well developed and were able to go ahead alone after thinning with a good basis on which to build their fruiting structure. With reference to time of thinning, early thinning was shown to be an advantage with all seed rates, but especially so where large numbers of seeds were planted. Any delay in time of thinning is liable to be much more harmful where six or ten seeds are planted than where only two or three seeds are planted. This greater latitude in time of thinning with a smaller number of seeds is a point decidedly in their favour, as the actual time of thinning may easily be delayed for a week or 10 days longer than desirable through unfavourable weather conditions or other circumstances. Results from the two years' experiments indicate, therefore,

that there is no advantage, when using acid-treated, water-sinking seed, in planting more than three seeds per hill. An interesting point is the effect of delayed thinning on the structure of the plant. It has been observed that there is a general absence of lateral branches on that side of the plant which faces its neighbour or neighbours in any one hill. If thinning is left too long this effect may become permanent and produce a lop-sided plant, particularly where a large number of seeds has been planted in one hill. The early and permanent adverse effect on the development of the individual plant of planting large large numbers of seeds, or of delay in thinning, becomes of particular importance when the question of single-plant selection arises. Where such work is being carried out it is essential that all the plants should have as equal a chance as possible. In this work, therefore, it is of special importance that planting should be carefully supervised to prevent large bunches, and that thinning should take place early. Where a larger number of seeds than three is planted, either accidentally or otherwise, it is recommended that the hills should be thinned down to three at a very early stage, and later thinned down to one. This is now a practice at Barberton with cotton experiments as well as with breeding plots, as the accidental occurrence of large clumps is a probable source of error in sampling for green weights and heights, especially in the early stages of growth.

[Cf. Abstr. 466, Vol. XVI. of this Review.]

267. COTTON PLANT: NITROGEN SUPPLY. By K. Shibuya *et al.* (*J. Soc. Trop. Agr.*, 1938, 10, 263. From *Summ. of Curr. Lit.*, xix., 15-16, 1939, p. 431.) According to experiments with culture solutions, cotton is a nitrophile plant—that is, it utilizes nitrate-N better than ammonia-N. The optimum pH is 7.0. Addition of calcium chloride to a nitrate culture solution, without alteration of pH, effects increase in growth and yield.

268. COTTON FLOWER BUDS DEVELOPMENT: INFLUENCE OF DAY LENGTH. By Z. Onodera. (*Proc. Crop. Sci. Soc. Japan*, 10, 1938, p. 26. From *Summ. of Curr. Lit.* xix., 19, 1939, p. 558.) Cottons from southern latitudes when grown in Korea often failed to produce bolls, the flower buds dropping too soon, especially on long summer days. By shading the plants so as to reduce the period of daylight to that of the southern habitat they fruited normally.

269. SIGNIFICANCE OF DISTANT HYBRIDIZATION IN BREEDING AND EVOLUTION. By N. I. Vavilov. (*Bull. Acad. Sci. U.S.S.R.*, Ser. Biol., 1938, p. 543. From *Pl. Bre. Absts.*, ix., 3, 1939, p. 283.) In connection with cotton, the success of Skovsted's cotton hybrids has been confirmed in the U.S.S.R., where hybrids have also been obtained between *Gossypium barbadense*, L., and *G. Thurberi*, Tod., the hybrid having then been crossed with *G. arboreum*, L., with the production of fertile hybrids having a lint length of up to 45 mm. Amphidiploids have also been produced between *G. herbaceum* and perennial and African species, and all possess larger seeds and longer lint than the parental species, and are sometimes earlier or more disease-resistant. Hybrids of Sea Island with *G. tomentosum* are nearly equal to Egyptian cotton in lint length, and at the same time resistant to insects.

270. ON THE ORIGIN OF CULTIVATED SPECIES OF COTTON. A HIGHLY FERTILE TRIPLE HYBRID (*G. barbadense* × *G. Thurberi*, TOD.) × *G. arboreum*. By F. M. Mauer. (*Bull. Acad. Sci. U.S.S.R.*, Ser. Biol., 1938, p. 695. From *Pl. Bre. Absts.*, ix., 3, 1939, p. 318.) The author reaches the conclusion that the "tetraploid" cottons originated at a very distant period, probably long before being taken into cultivation. The extreme genetic differences that exist between the individual species of the "tetraploid" group suggest that they arose independently from crosses between different diploid species; their geographical distribution supports this view. None of the existing diploid species has

chromosomes that are homologous with those of any tetraploids, and it seems clear that at the time when the tetraploid species arose the whole specific composition and distribution was quite different from those of the present day, and that the original parent species no longer exist. In an attempt to throw light on the subject various crosses were made. In the cross (*G. barbadense* × *G. Thurberi*) × *G. arboreum* six hybrids were obtained, three being highly fertile and three partially so. One plant was particularly fertile, vigorous and abundant in flower and fruit production; its flowers strongly resembled those of *G. barbadense* in colour and size, except that the stamen filaments were somewhat longer. The pollen was copious, large, yellow in colour and almost all perfect as judged by acetocarmine. The plant itself also resembled *G. barbadense*, the leaves being somewhat more dissected, and the bolls were almost identical with those of the wild forms of that species. The seeds were small, very slightly pubescent, with fine soft lint, very strong and up to 45 mm. in length. Meiosis in the hybrid was regular and 26 closed bivalents were present; it had clearly arisen from an unreduced egg cell of the female parent and contained the full genomes of all three species, thus (*G. barbadense* 26₁ + *G. Thurberi* 13₁ + *G. arboreum* 13₁) = 26₁₁. It is to be expected that amphidiploids of *G. arboreum* × *G. Thurberi* if obtained would fit into the existing species *G. barbadense* and serve to extend its range of variation; they might hence be of great practical breeding value; for instance, the introduction of characters such as the earliness, resistance to gummosis and tolerance of *G. arboreum*, and the cold resistance, resistance to wilt and gummosis, vigorous root system and prolific fruiting of *G. Thurberi* into *G. barbadense* would create immense possibilities in the improvement of this species. Other triple hybrids of the type referred to above are expected to have a similar practical interest.

271. THE RELATIONSHIP OF *Gossypium raimondii*, ULB. By J. B. Hutchinson. (*Trop. Agr.*, xvi., 12, 1939, p. 271.) This species has been grown at the Cotton Research Station, Trinidad, from seed obtained from Peru, and its behaviour in crossing extensively studied. In spite of the failure of crossing between them *G. raimondii* must be grouped with *G. klotzschianum* and *G. davidsonii* on account of their morphological similarity, and these three must be regarded as rather widely separated from the other New World cottons with $n=13$ chromosomes.

272. CONTINUOUSLY DEVELOPED COTTON FIBRES: PHYSICAL PROPERTIES. By J. H. Moore and D. B. Anderson. (*Text. Res.*, 1939, 9, p. 325. From *Summ. of Curr. Lit.*, xix., 18, 1939, p. 524.) In order to determine the influence of the growth ring pattern upon certain physical properties of the fibre, a comparison has been made between fibres of Mexican Big Boll 128-6 cotton developed under continuous light and therefore free from daily growth rings, and fibres with prominent growth rings produced by pot-grown plants out-of-doors. The breaking load, fibre weight per inch and intrinsic strength were determined. The data are treated by the analysis of variance method and show that fibres produced under constant illumination are finer and of lower breaking load but of the same intrinsic strength.

273. PHYSICAL CHARACTERISTICS IN COTTON AND THEIR INTERRELATIONSHIP. By M. A. Grimes. (*Texas Sta. Rpt.*, 1937, p. 143. From *Exp. Sta. Rec.*, 81, 1, 1939, p. 155.) In this progress report on the study of two varieties of cotton, the polarizing microscope method was used for maturity tests, and the Chandler method for strength tests. The fineness of the fibres was determined from cross-sections made with the Hardy device, the area of the projected section being measured with a planimeter.

274. FURTHER STUDIES ON THE INHERITANCE OF LEAF SHAPE IN ASIATIC *Gossypiums*. By J. B. Hutchinson et al. (*Ind. Jour. Agr. Sci.*, ix., 6, 1939,

p. 765.) Describes the work entailed in the recognition of a new allelomorph (L^M) in a strain known as 1090 obtained from Nagpur.

[Cf. Abstrs. 452, Vol. XI., and 733, Vol. XIV. of this Review.]

275. MEMOIRS OF THE COTTON RESEARCH STATION, TRINIDAD. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d.) The fifteenth number of Series A, Genetics, has recently been published, and contains the following papers reprinted from the *Journal of Genetics*:

(a) **THE GENETICS OF LEAF SHAPE IN DIPLOID COTTONS, AND THE THEORY OF GENE INTERACTION.** By R. A. Silow. Two further members of the leaf-shape allelomorphic series in the cultivated Old World cottons, *Gossypium arboreum* and *herbaceum*, are described. One, L^N , was found in a strain of *G. arboreum*. The other, L^A , is confined to the wild species *G. anomalum*. The allelomorphs behave as typical shape genes, affecting relative growth in three directions. Evidence derived from the new members of the series indicates that the two primary components of leaf shape, sinus length and lobe width, are independently controlled. Differences between the allelomorphs in leaf length may be interpreted in terms of changes in these two dimensions—the shape effect. It is postulated that the gene is a compound one, with two gene centres controlling laciniation and lobe width respectively, and the field allelomorphs have been serially arranged as follows on the basis of differences in episome number on these two gene centres:

$$(a) \text{ With reference to laciniation: } L^L - \begin{pmatrix} L^N \\ L^A \end{pmatrix} - L - 1.$$

$$(b) \text{ With reference to lobe width: } L^L - \begin{pmatrix} L^N \\ L \end{pmatrix} - \begin{pmatrix} L^A \\ 1 \end{pmatrix}.$$

In the field series dominance is in the direction of narrowness, but mutant members of the series, which are relatively broad, are dominant over all others. It has not been possible to offer any explanation of this. The field series and the mutant series had also been stated to differ in their dominance reactions, but it is shown that all exhibit a similar degree of partial dominance. The dominance situation which had been thought to exist was reminiscent of the frequently expressed belief that wild-type and mutant genes differ in their dominance mechanism, which is also shown to be unjustified. Dominance may be regarded as a function of allele interaction, dependent upon the magnitude of effect of the gene relative to the possible range in expression of the character affected, and upon other genes working towards the same result. The bearing of this conception on some current evolutionary theories is discussed, and it is concluded that the acquisition of dominance may be regarded as a subsidiary feature of the primary action of natural selection upon the genotype as a whole.

(b) **THE GENETICS AND TAXONOMIC DISTRIBUTION OF SOME SPECIFIC LINT QUALITY GENES IN ASIATIC COTTONS.** By R. A. Silow. It has been possible to recognize particular members of the gene complex controlling number of lint hairs on the cotton seed by their effect on the glabrous lintless mutation. The latter was used as an analyser to separate the genes controlling lint development into two series, those hypostatic to it and those epistatic to it and acting as modifiers. The basic lint percentage effect of a single epistatic gene in the heterozygous phase is about 6 to 10 per cent. on the lintless genotype. The epistatic genes show a reductive interaction with other genes working towards the same effect, so that in the fully linted genotype their effect is less than one-fifth of their basic value. The epistatic genes are shown to have a clearly defined varietal and specific distribution, not associated with the ginning capacity of the strains in which they occur, showing that in different taxonomic

groups a typical quantitative character may be controlled by quite distinct complexes of genes.

276. THE INHERITANCE AND LINKAGE RELATIONS OF YELLOW SEEDLING, A LETHAL GENE IN ASIATIC COTTON. By C. P. Yu. (*J. Genet.*, **39**, 1, 1939, p. 61.) Yellow seedling, a lethal gene in Asiatic cotton, is a simple Mendelian recessive to normal. It has been observed in China three times in three unrelated varieties of cotton, in 1926 by C. C. Feng in both "Chicken Foot" and "Wuchang White Seed" and recently by the author in "Shaokan Long Staple" cotton. The results of study indicate that (a) yellow seedling and anthocyanin pigmentation are linked, the cross-over value being about 9 per cent., (b) yellow seedling is inherited independently of curly leaf and corolla colour.

[Cf. Abstrs. **530**, Vol. III.; **696**, Vol. VIII.; **119**, **259**, Vol. X.; **452**, **614**, Vol. XI.; **287**, Vol. XV. of this Review.]

277. THE INHERITANCE AND LINKAGE RELATIONS OF CURLY LEAF AND VIRESCENT BUD, TWO MUTANTS IN ASIATIC COTTON. By C. P. Yu. (*J. Genet.*, **39**, 1, 1939, p. 69.) Curly leaf, **cu**, and virescent bud, **V₁**, are two newly-discovered genes affecting seedlings. Both of them are completely recessive, and form single-factor pairs with the normal. It is shown that curly leaf and leaf shape are linked, with a cross-over value of about 16.6 per cent. Curly leaf and the following characters are independently inherited: anthocyanin pigmentation, corolla colour, lint colour and seed fuzz. Virescent bud and the following characters are independently inherited: curly leaf, anthocyanin pigmentation, corolla colour, seed fuzz, leaf shape and yellow seedling. From the linkage studies of Hutchinson and of the author it is concluded that the lint colour genes which they investigated are distinct.

[Cf. Abstrs. **530**, Vol. III.; **696**, Vol. VIII.; **476**, Vol. IX.; **119**, **289**, Vol. X.; **452**, Vol. XI.; **622**, Vol. XII.; **143**, Vol. XIII. of this Review.]

278. VARIABILITY OF PLANT DENSITY AND THE ESTIMATION OF YIELD OF COTTON BY SAMPLING. By R. J. Kalamkar and - Dhannalal. (*Proc. 26th Ind. Sci. Congr.*, Pt. III., Lahore, 1939, p. 198. From *Pl. Bre. Abstrs.*, ix., **4**, 1939, p. 373.) Five varieties of cotton, replicated four times, were grown experimentally to investigate variability of plant density, and to study sampling technique. The number of plants surviving differed for different varieties, and when adjusted for plant number one variety was shown to be definitely inferior in yield to the others. Comparison of estimated and actual yields showed that it was possible to use sampling technique with accuracy for estimating the yield of cotton.

279. CARBOHYDRATES OF THE COTTON PLANT UNDER DIFFERENT SEASONAL CONDITIONS AND FERTILIZER TREATMENT. By D. R. Ergle *et al.* (*J. Amer. Soc. Agron.*, **30**, 11, 1938, p. 951. From *Exp. Sta. Rec.*, **80**, 6, 1939, p. 762.) Seasonal changes in carbohydrate concentrations were similar for cotton plants grown on Wilson fine sandy loam and Houston black clay soils in Texas. The level of carbohydrates was greater in plants from the Wilson soil, probably due to drought conditions, than those from the Houston. The monosaccharide, disaccharide, and polysaccharide contents of plants from the Wilson soil were affected by fertilizers, while only polysaccharides in plants from the Houston soil seemed to be influenced definitely. Correlation of fertilizer treatment and plant growth was noted for both soils. Whole plants did not reflect effects of fertilizer treatment as well as root and aerial segregates studied previously.

280. COMPOSITION OF BARK AND INNER PART OF ROOTS OF THE COTTON PLANT. By L. E. Heasler *et al.* (*J. Amer. Soc. Agron.*, **31**, 6, 1939, p. 528. From *Exp. Sta. Rec.*, **81**, 6, 1939, p. 778.) In continued studies the bark was separated from the stele of roots of cotton plants grown on Wilson clay loam soil under

various fertilizer treatments. Under experimental conditions covering the period from early square formation to early opening of bolls, the bark was found to be particularly rich in the labile carbohydrate and dialysable nitrogenous constituents. The inner portion of the root contained more polysaccharides and dialysable and non-dialysable phosphates. The latter constituents increased when phosphates were added to the soil. All nitrogen fractions in the root parts, especially the cathode-nitrogen constituents in the bark, were influenced by the composition of the fertilizer used. The ketose sugars appeared to be important in the physiology of the cotton plant.

281. COTTON ROOT: MYCORRHIZAL HABIT. By Y. Sabet. (*Nature*, 1939, **144**, p. 37. From *Summ. of Curr. Lit.*, xix., **14**, 1939, p. 413.) The typical vesicular-arbuscular endophyte (*Rhizophagus* sp.) causing the mycorrhizal habit of cotton roots has been observed within the cortical tissues of certain strains of cotton, and its association with Sudan soil is briefly mentioned.

282. BUD-SHEDDING AND ITS RELATION TO POLLEN DEVELOPMENT IN COTTON. By Abdel-Ghaffar Selim. (Min. of Agr., Egypt, *Tech. and Sci. Serv. Bull.* No. 206, 1939.) Observations, extending over three years, on "normal" shedding, as distinct from that due to injuries, with especial attention to bud-shedding. No attempt is made to deal with causation. The author concludes as follows: "Bud-shedding was economically very important and amounted to about 30 to 40 per cent. of the total plant production. Maximum shedding of buds took place 21 days before flowering time of the same. Bud-shedding occurred at the time of the early prophase stage of meiosis of the pollen-mother cells. Formation of absciss layer corresponded to first activity of pollen-mother cells. Boll-shedding was less important than bud-shedding and amounted to 10-15 per cent. in normal cases. Maximum boll-shedding occurred 8 days after flowering time. Flower-shedding was negligible."

[Cf. Abstr. 601, Vol. IV. of this Review.]

283. MEMOIRS OF THE COTTON RESEARCH STATION, TRINIDAD. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d. post free.) The eleventh number of Series B, Physiology, has recently been published, and contains the following papers reprinted from the *Annals of Botany*:

(a) EXPERIMENTS ON THE EXTRACTION OF SAP FROM THE VACUOLE OF THE LEAF OF THE COTTON PLANT AND THEIR BEARING ON THE OSMOTIC THEORY OF WATER ABSORPTION BY THE CELL. By T. G. Mason and E. Phillis. A method is described for the separation of the sap in the vacuole from the sap derived from the decomposition of the protoplasm. From the concentrations in these saps and the concentration in sap from the whole cell, the distribution of water between the vacuole and the protoplasm was calculated. The distribution of sap-water in the cell was also estimated by extrapolation of the curve relating pressure in the hydraulic press and weight of sap-water obtained. Both methods indicated that only about 30 per cent. of the water in the cell is present in the vacuole. It is pointed out that these results do not accord with the view that the protoplasm occupies too small a proportion of the cell to exercise an important part in regulating absorption of water.

It is shown that the osmotic pressure of the vacuolar sap is very much less than that of the solution required to plasmolyse the mesophyll. It is also demonstrated that the compact leaf residue from the hydraulic press after the vacuolar sap has been extracted (1) exhibits respiratory activity, and (2) can absorb water from solutions of much greater osmotic pressures than that of the vacuolar sap and also from the vacuolar sap itself. These observations are considered to support the suggestion of Bennet-Clark, Greenwood, and Barker that water is secreted into the vacuole by the protoplasm.

(b) STUDIES OF THE PARTITION OF THE MINERAL ELEMENTS IN THE COTTON PLANT. I. PRELIMINARY OBSERVATIONS ON NITROGEN AND PHOSPHORUS. By E. Phillis and T. G. Mason. Observations, limited to the leaf, were made on the changes in the partition of nitrogen and of phosphorus between the sap-soluble fraction and the fraction that is insoluble in the sap. The insoluble fraction expressed as a percentage of the total amount of the element is termed the *partition index*. Over wide ranges of nitrogen, phosphorus, and potassium supplies to the roots, the *partition index* of nitrogen was negatively correlated with the weight of nitrogen per 100 gm. dry weight. Over wide ranges of nitrogen and phosphorus supplies to the roots, the *partition index* of phosphorus was also negatively correlated with the weight of phosphorus per 100 gm. dry weight, but under varying potassium supply this was not the case. It was concluded that the saturation of the tissues with nitrogen and phosphorus respectively was an important factor determining the partition of these elements. It was suggested (a) that luxury consumption of nitrogen and of phosphorus occurs even when these elements are controlling dry weight production, (b) that no distinction can be drawn between the luxury and storage forms of these elements.

294. MEMOIRS OF THE COTTON RESEARCH STATION, TRINIDAD. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d. post free.) The twelfth number of Series B, Physiology, has recently been published, and contains the following paper reprinted from the *Annals of Botany*:

FURTHER STUDIES ON TRANSPORT IN THE COTTON PLANT. VII. SIMULTANEOUS CHANGES IN THE PRODUCTION AND DISTRIBUTION OF DRY MATTER UNDER VARYING POTASSIUM SUPPLY. By E. Phillis and T. G. Mason. In this paper observations are recorded on the changes in the dry weight and in the distribution of the dry weight between the leaves and the rest of the plant under varying supplies of potassium, nitrogen, and phosphorus. It was found that dry weight and its distribution (rest of plant/leaf lamina) are highly correlated under varying potassium supply. This correlation holds both under conditions of low as well as under conditions of high potassium supply. No such correlation was observed for nitrogen, while the results for phosphorus were inconclusive. This correlation was interpreted as being due to the existence of a quantitative relation under varying potassium supply between the rate of photosynthesis and the rate at which materials are exported from the assimilating cells to the phloem of the leaf. It was suggested that potassium controls the rate of photosynthesis by altering the rate at which carbon dioxide diffuses to the chloroplasts, and that it controls equally the rate of sugar export from the chloroplast to the phloem of the leaf by altering the rate at which sugar diffuses through the protoplasm of the parenchyma.

295. THE NEWEST FAD, COLCHICINE, AND ITS ORIGIN. By S. J. Wellensiek. (*Chronica Brit.*, 5, 1939, p. 15. From *Pl. Bre. Absts.*, ix., 3, 1939, p. 287.) The literature relating to the use of colchicine in the induction of polyploidy in plants is briefly reviewed, and the main uses of the process to the breeder and geneticist are pointed out.

296. COLCHICINE TREATMENT AS A MEANS OF INDUCING POLYPLOIDY IN COTTON. By S. G. Stephens. (*Trop. Agr.*, xvii., 2, 1940, p. 23.) Describes experiments at the Cotton Research Station in Trinidad. Sea Island (V.135) and N.14 (*G. arboreum* v. *neglectum*) were mainly used. Treatment was applied to newly germinated seeds, to plumules in the cotyledon stage, to apical buds, flower buds, and young bolls. So far success has been attained only in N.14, tetraploids being obtained by the first two methods. One hexaploid has been obtained by treatment of a sterile species hybrid by the second method. The tetraploid crosses

freely with Upland and Sea Island cottons, giving vigorous hybrids which have so far proved sterile.

287. DUPLICAÇÃO DO NUMERO DE CROMOSÔMIOS EM CAFÉ, ALGODÃO E FUMO, PELA AÇÃO DA COLCHICINA. By A. J. T. Mendes. (*Bol. Tec. Sec. Agr., Industr. Com. S. Paulo*, 1939, No. 57. From *Pl. Bre. Absts.*, ix., 3, 1939, p. 333.) A review of the work of other authors on the action of colchicine is given. The present experiments consisted of germinating seeds of *Coffea arabica* ($2n=44$) in solutions of colchicine of concentrations varying from 0.075 to 0.3 per cent. In the latter concentration, after an immersion of 4 days' duration, various abnormal plants were produced and all proved to have $2n=88$. Root development, which tends to be inhibited by relatively high concentrations of colchicine, was stimulated by the addition of a solution of indole butyric acid, which greatly adds to the practical value of the method. Similar treatment of cotton seeds resulted in the production of a number of abnormal plants of *Gossypium hirsutum* ($2n=52$) with $2n=104$ and *G. herbaceum* ($2n=26$) with $2n=52$. The concentration and time of immersion required were slightly less for cotton than for coffee.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

288. COTTON HAIR: DEVELOPMENT. By K. Hess. (*Kleipzig's Textile Z.*, 42, 1939, p. 629. From *Summ. of Curr. Lit.*, xx., 2, 1940, p. 37.) Photographs showing the development of cotton bolls and hairs are given and the results of physical and chemical investigations of the hair wall are discussed. The cotton hair in the boll increases in length during the first 20 to 25 days, and this period is followed by one in which the hair wall thickens without increasing further in length. Hairs in the first period of development give an X-ray diagram showing two characteristic rings which are attributed to a primary non-cellulosic substance. Ripe hairs give cellulose diagrams. The young hairs contain wax, phosphatide, protein and pectin materials, and when these are removed by extraction the young hairs show the same X-ray diagrams and double refraction, swelling, and viscosity effects as ripe hairs. Cellulose, therefore, appears to be present in the primary wall but not in the regular lattice arrangement that produces cellulose X-ray diagrams. Possible mechanisms of cellulose formation in the cotton hair are discussed, and it is pointed out that the non-cellulosic substance may be an auxiliary substance for cellulose formation, or may merely serve to prevent crystallization of cellulose in the primary wall. The cellulose and non-cellulosic substance may exist in the young hair walls in the form of a complex covered with wax.

289. COTTON HAIR: STRUCTURE. By S. W. Gontscharow and F. G. Burwasser. (*Sibirnik Inst. Akad. Nauk.*, 9, 1938, p. 76. From *Summ. of Curr. Lit.*, xix., 22, 1939, p. 647.) Microscopic examination reveals a system of extremely thin membranes holding the cellulosic constituents together. The properties of the hair, and its behaviour towards chemical agents, are determined by these membranes. Under the influence of caustic alkali the cuticle is gradually removed from the hair, revealing a spiral structure and a new system of membranes. Acids then attack the membrane substance and the cellulosic network is exposed.

290. COTTON HAIR: STRUCTURE. By W. Wergin. (*Naturwissenschaften*, 26, 1938, p. 613. From *Summ. of Curr. Lit.*, xix., 13, 1939, p. 402.) Longitudinal sections of ripe cotton hairs 5 μ thick were treated with cuprammonium and caustic soda. Besides the cellular defibrillation of the lamellæ, it was possible to discern a partition of the single fibrils into fragments with dimensions about

0.2 μ . It is suggested that the appearance is due to the swelling of a more reactive substance occurring at regular intervals between the fragments.

291. COTTON FIBRE: FINENESS AND MATURITY. By F. T. Peirce and E. Lord. (*J. of Text. Inst.*, **30**, 1939, T173. From *Summ. of Curr. Lit.*, xx., **4**, 1940, p. 79.) The fineness of cotton, an important factor in spinning quality, depends on the perimeter of the fibre and the extent to which this is filled out with cellulose. Perimeter depends mainly on the variety of cotton, but thickening on climate and other conditions of growth. It is important to be able to isolate these genetic and climatic factors, but direct measurements of perimeter and thickening are too tedious for practical purposes. Hair weight per centimetre and immaturity count as determined in the B.C.I.R.A. stapling tests are related dimensions that can be readily measured, and the present investigation deals with the relationship between them and geometric dimensions of the fibre that could be ascertained from cross-sections. A correlation between hair weight, H , and immaturity count ($N - D$) (difference between percentage of "normal" and "dead" fibre) is established by measurements on samples of cotton from bolls picked at successive dates from 25 to 60 days after secondary thickening had set in, and similar data for several varieties are shown to be consistent with the same relation between H and ($N - D$). It is proposed, therefore, to obtain a "standard hair weight," H_s , which would strictly reflect the genetic factor of the perimeter, by referring hair weights to that arbitrary, optimum state of immaturity provided by the soil and climate of Egypt, for which ($N - D$) is taken as $(67 - 7) = 60$. The relation between the true and standard hair weights and the immaturity count is given by the equation

$$100H/H_s = 0.5 (N - D) + 70.$$

Other relations are established between H_s and dimensions actually measured on cross-sections. The data, from a wide range of material, are treated statistically throughout.

292. APPARATUS FOR MEASUREMENTS OF LENGTHS OF COTTON FIBRES. By B. Johnson. (*Bull. No. 381, Agr. Exp. Sta., Fayetteville, Arkansas, 1939.*) A description, with illustrations and diagrams, of two pieces of apparatus designed to increase the speed at which length determinations of fibres can be made. The first machine is a mechanical fibre comber for seed cotton, the advantages of this type of combing being discussed. A simple measurement of length of fibres combed in the mechanical fibre comber is described. The second machine is a photoelectric cotton fibre sorter for seed cotton. This apparatus will sort the fibres of one seed or give the sorting of a composite sample of as many as eight seeds at a time. Results of sortings from the same sample can be reproduced within satisfactory limits of accuracy.

293. MEASURING THE DIAMETER OF THE COTTON FIBRE. By J. H. Moore. (*J. Amer. Soc. Agron.*, **30**, 7, 1938, p. 604. From *Exp. Sta. Rec.*, **80**, 3, 1939, p. 431.) The diameters of uncollapsed and mercerized fibres were measured in seven strains of American Upland cotton. The correlation of uncollapsed with mercerized diameter amounted to 0.95. The ratio of mercerized to uncollapsed diameter in the seven cottons ranged from 0.623 to 0.665, averaging 0.643. Methods are described for measuring the uncollapsed and mercerized fibre diameter. The gelatin method of sectioning cotton fibres is described, and transverse sections of uncollapsed, normal collapsed, and mercerized fibres are shown.

294. THE RELATION OF CERTAIN PHYSICAL FIBRE PROPERTIES IN IMPROVED COTTON VARIETIES TO SPINNING QUALITY. By J. H. Moore. (*N. Carolina Sta. Tech. Bull.* 58, 1938. From *Exp. Sta. Rec.*, **80**, 6, 1939, p. 860.) Varieties of

American Upland cotton comprising Acala 4,067, Coker-Cleveland 884-4, Mexican 128, Mexican 87-8, Rowden 40, Rowden 2,088, and Farm Relief No. 1 were grown near Raleigh, North Carolina, in 1932 and 1934 on Cecil sandy loam, and the lint was spun into yarns. Significant differences were apparent in boll weight, seed weight, and lint index, but not in yields. Varieties giving the highest yarn strength yielded as well as varieties showing the lowest yarn strength. During each season cotton produced from the respective varieties showed significant differences in fibre diameter and weight, staple length, breaking load per fibre, and percentage of thin-walled fibres; and in spinning tests significant differences were indicated in the yarn strength of 23's, 30's, and 40's yarns (with twist factors of 4.25 and 4.75 to each count), but none between varieties in running quality during the several spinning processes or in appearance of yarns. Special methods were used to analyse relations of the several fibre properties to variability in yarn strength. Higher yarn strengths were associated with a smaller fibre diameter, higher unit fibre weight, and, to a limited extent, with an increase in staple length, while increasing number of fibres in cross-sections was associated with weaker yarns. Average breaking load per fibre was not definitely related to yarn strength, which also was not related significantly with total calculated breaking load of the fibres in a count of yarn. An increasing percentage of thin-walled fibres might be associated with higher yarn strength in one season and be negligible in another season. In choosing plants for breeding cotton strains having fibre properties associated with high spinning value, the breeder of American Upland varieties evidently should select for longer staple length, smaller diameter, relatively high fibre weight in strains having similar small diameters, and a reasonable amount of strength.

295. COTTON FIBRE: STRENGTH AND X-RAY STRUCTURE. By A. A. Morozov and M. A. Rabkin. (*Colloid J., U.S.S.R., 5, 1939, p. 135. From Summ. of Curr. Lit., xx., 1, 1940, p. 14.*) The degree of orientation of micelles, as revealed by X-ray diagrams, increases with increasing tensile strength of the fibres. Strengths varied between 32 and 40 kg. per sq. mm.

296. DISINTEGRATION OF THE CELL MEMBRANE OF THE COTTON FIBRE BY A PURE CULTURE OF BACTERIA. By F. E. Hooper. (*Contrib. Boyce Thompson Inst., 10, 3, 1939, p. 267. From Exp. Sta. Rec., 81, 5, 1939, p. 622.*) An aerobic bacterial rod capable of growing on inorganic media, with such material as filter paper and cotton as the sole carbon source, was isolated from the soil, studied in detail, and its disintegration of cotton fibres followed microscopically. The cuticle is removed early in the attack, and then both cementing materials and cellulose are slowly digested. The particulate nature of the cellulose fibrils of the cell wall is clearly seen in the partially disintegrated fibres.

297. BEHAVIOUR OF THE CELL MEMBRANE OF THE COTTON FIBRE IN CUPRAMMONIUM HYDROXIDE SOLUTION. By W. K. Fair. (*Contrib. Boyce Thompson Inst., 10, 1, 1938, p. 71. From Exp. Sta. Rec., 80, 6, 1939, p. 747.*) The cellulose component of the cell membrane of the cotton fibre—in the form of diminutive cellulose particles—failed to dissolve in the standard solution of cuprammonium hydroxide to produce the viscosities commonly attributed to it, but was transformed into a swollen, viscous mass of cementing material in which the cellulose particles were dispersed. The separated cellulose particles from which the cementing material had been removed did not produce viscosities in cuprammonium hydroxide. One component of the cementing material—the pectic fraction extracted with ammonium oxalate—produced viscosities in the same solution to the point of a stiff gel. It thus appears clear that the viscosity-producing power of the cementing material, or of any one of its fractions, has been overlooked, as has been also the presence in the cuprammonium solution

of the cellulose in the form of diminutive particles of uniform size and shape, still undissolved, and merely in a state of dispersion. The bibliography contains 35 references.

298. SOME OBSERVATIONS UPON THE DISPERSION, ELECTROKINETIC AND COAGULATION BEHAVIOUR OF COTTON FIBRES IN CUPRAMMONIUM HYDROXIDE SOLUTION. By W. A. Sisson. (*Contrib. Boyce Thompson Inst.*, **10**, 1, 1938, p. 113. From *Exp. Sta. Rec.*, **80**, 6, 1939, p. 748.) Treated with electrolytically prepared cuprammonium hydroxide solution cotton fibres swelled and were disintegrated into small particles which dispersed in the solution, exhibited Brownian movement, and possessed a negative charge. On removal of the cuprammonium cations by electrolysis the particles were coagulated to form a flocculent deposit. Microscopic examination indicated the deposit to consist of uniform-sized cellulose particles giving a mercerized X-ray diagram. The presence of particles in the deposited fibre material is attributed to a flocculation of colloiddally dispersed crystalline particles rather than to the recrystallization of cellulose from a state of molecular dispersion in the cuprammonium solution. It is suggested that the peptization and change in crystalline structure of the cellulose particle may be associated with the formation of a swelling compound with this cuprammonium solution.

299. THE EFFECT OF CLINGING POWER OF FIBRES ON YARN-STRENGTH IRREGULARITY. By K. R. Sen and N. Ahmad. (*Ind. J. Agr. Sci.*, March, 1939. From *Ann. Rpt. of Tech. Lab. Bombay*, 1938-39.) It is found that a distinct tendency exists for fibres possessing high clinging power to yield yarns which register high yarn-strength irregularity. This feature holds both for cotton fibres and staple (viscose) fibres spun either in the pure state or in a mixture. No direct proportionality between the two is observed owing to the following disturbing factors: (1) fibre-to-fibre variation in clinging power, (2) sampling errors in single-thread test, and (3) lack of perfect homogeneity in the mixture.

300. THE EFFECT OF FIBRE-WEIGHT PER INCH ON THE SPINNING QUALITY OF SOME INDIAN COTTONS. By N. Ahmad. (*Ind. Text. Jour.*, April, 1939. From *Ann. Rpt. of Tech. Lab. Bombay*, 1938-39.) The earlier work of the Technological Laboratory had shown in regard to Indian cottons that the mean fibre-length plays the most important part in determining their spinning quality, while the fibre-weight per inch takes the second place in this respect. In this analysis, however, no attempt was made to sort out and make spinning tests on such cottons as differed in respect of only one property but were similar in respect of the other fibre-properties. Accordingly, five botanically interrelated strains having practically the same mean fibre-length, but differing considerably in their mean fibre-weight per inch, were tested in 1937-38. From the results of these tests the conclusion is drawn that an increase in the mean fibre-weight per inch of a cotton would, in general, be followed by a decrease in the strength of yarns spun from it, that this decrease may, to some extent, be arrested if the cotton possessing a high fibre-weight per inch also possesses high fibre-strength, but that it would be accentuated if the increase in the fibre-weight per inch is associated with a decrease in fibre-strength.

301. THE EFFECT OF ENVIRONMENTAL AND GENETICAL FACTORS ON FIBRE MATURITY OF COTTON. By A. N. Gulati and N. Ahmad. (*Ann. Rpt. of Tech. Lab. Bombay*, 1938-39, p. 35.) A summary of a paper read at the Indian Science Congress in January, 1939. All changes in plant characters are either environmental or genetical in origin. To what extent each of these modifies fibre maturity of cotton is the subject of the present investigation, for which suitable material was obtained from five well-designed experiments laid out at the Institute of Plant Industry, Indore. Samples from only two of these

experiments have so far been tested, while work is in progress on the remaining material. The results obtained are as follows:

Agronomical Factors in Regard to P.A.289F and Mollisoni.—Of the two sowing periods May suited P.A.289F, while June helped Mollisoni to attain best fibre-maturity percentages. Preparatory cultivation consisting of fallow in *Kharif* and wheat in *Rabi* repeated over two years proved beneficial only to the fibre-maturity of P.A.289F, while Mollisoni did well without this treatment. Heavy irrigation, comprising eleven waterings, as compared with moderate irrigation, six waterings, was helpful in raising the fibre-maturity of both cottons. Mollisoni, however, did equally well with moderate irrigation in the absence of preparatory cultivation. Nicifos was more beneficial to P.A.289F than “cake” or no-manure, but “cake” was more suitable to Mollisoni. Single spacing, as opposed to double spacing, improved the maturity of both cottons.

Hybridization Factors in Relation to Three-Parent Varieties, Malvi, Bani, and Cwn 520, and their Three F₁ Crosses.—Mean fibre-maturity of the hybrids showed positive improvement or heterosis over those of the parents. Variance due to variety was found significant for 100:1 odds, while that due to blocks, plots and plants was not significant.

302. THE EFFECT OF STORAGE AT DIFFERENT RELATIVE HUMIDITIES ON THE STRENGTH AND COLOUR OF COTTON. By N. Ahmad and A. N. Gulati. (*Ann. Rpt. of Tech. Lab. Bombay*, 1938-39, p. 36.) A summary of a paper read at the Indian Science Congress in January, 1939. An investigation undertaken to obtain systematic data both on strength and whiteness, together with the rate of growth of micro-organism infection. Two cottons, Broach Palej and B.D.8, were selected for the purpose and stored over different relative humidities. Certain difficulties were encountered in the beginning in ensuring the proper humidities, but the correct humidities were eventually obtained by using solutions of calcium chloride and pure water in properly sealed desiccators. The results obtained so far indicate that both cottons stored for about four months in an atmosphere of saturated relative humidity (which read only 96 per cent. on a dew-point hygrometer) completely deteriorate in strength and suffer enormously in colour owing to heavy formation of fungal spores. The effects are progressive with time, and observation on strength tests made every fortnight gives their rates of development. At lower relative humidities—i.e., 90 per cent., 75 per cent. and 60 per cent.—no deterioration in strength or whiteness has been observed in four months in B.D.8, while in Broach Palej a slight tendency to increased infection and some loss in strength and whiteness has been noticed at 90 per cent. R.H. in the same period. Cottons kept at still lower relative humidities—i.e., 30 per cent. and dry, the latter over anhydrous granulated calcium chloride—did not show any loss in strength even in one year. These experiments are being continued.

303. THE EFFECT OF CLIMATIC EXPOSURE ON TEXTILE FIBRES AND FABRICS. By A. C. Thaysen *et al.* (*Ann. of Appl. Biology*, xxvi., 4, 1939, p. 750.) An account of an investigation carried out to obtain “evidence regarding both the participation of micro-organisms in the mildewing of fabrics and the conditions in which mildewing and other deterioration of fabrics would occur.” Other objects were to ascertain the types of organisms which are destructive to textiles, the nature of the damage caused, and the methods by which the damage could be avoided or minimized. The results are shown by means of tables and graphs.

304. CREASE-RESISTANT COTTON FABRICS: PRODUCTION. By P. M. Pogoshev. (*Chloptschatobumash. Prom.*, 1937, 12, p. 30 [through *Chem. Zentr.*, 1, 1939, 2104]. *Abstr. J. of Text. Inst.*, xxx., 9, 1939, A580.) The following are

considered to be the best conditions: (1) A molecular ratio between urea and formaldehyde of 1:2 or 2:3. (2) A transparent and elastic film is secured by the addition of ammonium acetate. (3) The condensate should consist of products of the initial stages of the reaction—that is, of methyl urea and dimethylol urea—and less of methylene urea. (4) The fabric should be wetted out in alizarin oil or else mercerized. (5) The best temperature for the application is 15 to 20°C. (6) The final condensation and fixation of the impregnated fabric is effected by heating for 2 to 3 minutes at 165 to 170° C. (7) The fabric is rinsed with water at 50° C. and soap at 60 to 65° C.

305. COTTON FABRICS: EFFECT OF WEAVE ON STRUCTURE. By P. Kober. (*Textilberichte*, 20, 1939, p. 337. From *J. Text. Inst.*, xxx., 8, 1939, A516.) The influence of the nature of the weave of fabric structure is discussed and its effect in plain weave, 1/2, 2/2 and 1/3 twill is examined. It is pointed out that when the same yarns are used and the same warp and weft densities, the closeness and strength of the fabric structure decrease in the order named. A thread crossing is defined as the passage of a thread from one face of the fabric to the other, and it is shown that the ratio of the actual number of crossings present to the maximum possible number of crossings per repeat decreases in the order given. An expression is deduced for the space required for a thread crossing, assuming that the yarns are incompressible and that the yarn densities are the maximum permitted by the weaver. The space requirement per thread is calculated for each of the weaves studied, and that ratio of this figure to the value for a plain weave is termed the weave coefficient. It is shown that openness of structure due to a given weave can be compensated by increasing the yarn density, and the required increase in yarn density to produce a fabric structure of the same closeness as would be obtained with a plain weave can be calculated from the weave coefficient. Increasing the yarn density, however, though it may give the required density of structure, does not increase the strength of the structure to the same degree as would increased interlacings of the yarns. The practical application of the results is illustrated by a calculation of the required warp and weft densities to give with a 2/2 twill weave a fabric having the same compactness of structure as a plain weave fabric of specified yarn densities.

306. TRANSPARENT COTTON FABRICS: PRODUCTION. By J. J. Podreschetnikov *et al.* (*Chloptschatobumash. Prom.*, 8, No. 7/8, p. 52 [through *Chem. Zentr.*, 1, 1939, 4255]. Abstr. *J. of Text. Inst.*, xxx., 9, 1939, A580.) Non-mercerized fabric is treated for 10 seconds with 51° Bé. sulphuric acid at 15 to 20° C., mangled, washed until free from acid, mangled (90 to 100 per cent. of moisture), steeped for 20 to 30 seconds in cold caustic soda of 26 to 30° Bé., and rinsed cold. For reserve printing, parts are protected by means of water-glass.

307. COTTON LINTERS: ACETYLATION. By D. Krüger. (*Wochbl. Papierfabr.*, 70, 1939, p. 474. From *Summ. of Curr. Lit.*, xix., 23, 1939, p. 664.) The catalytic effect of perchloric acid in the acetylation of cellulose is reported. The effect is greatest with the purest material (*e.g.*, standard cotton cellulose). Chlorides depressed the effect. K and Na perchlorates are not catalysts, but Mg and Ca perchlorates are. Pre-treatment with dilute hydrochloric acid hastened acetylation.

308. COTTON MIXINGS: BLENDING OF STAPLES FOR STRENGTH. (*Cotton*, U.S., 1, 1940, p. 46. From *Summ. of Curr. Lit.*, xx., 6, 1940, p. 124.) In answer to a question whether the admixture of a longer cotton causes much improvement in the strength of the yarn, experiences are reported from six mills in the United States. All are unfavourable to the blending of different staples.

309. REGAIN OF TEXTILES AND HUMID ATMOSPHERE CHANGES. By A. B. D. Cassie. (*J. of Text. Inst.*, xxxi., 2, February, 1940, T17.) The observation that textile fibres pick up and lose water vapour very rapidly is used to discuss water vapour and heat exchange between a humid atmosphere and the fibres. The results are fundamental for calculations on textile drying and conditioning processes, and examples of their application are given. The theory is also applied to physical problems of hygiene of clothing. It is shown that hygroscopic fibres can give protection against sudden temperature changes in normal humid atmospheres, and the protection increases with the slope of the regain R.H. curve for the fibres.

310. COTTON YARNS: STRENGTH. By J. Wiernsberger. (*L'Indus. Text.*, 56, 1939. From *Summ. of Curr. Lit.*, xix., 19, 1939, p. 554.) An equation is deduced for the maximum theoretical strength of a cotton yarn, and it is pointed out that actual mean strengths of cotton yarns made from Sakel, American and Indian cottons should reach 0.85, 0.6 and 0.5, respectively, of the theoretical values under specified conditions of twist, etc. The ratio of minimum to mean strength and the regularity of strength expressed by the ratio of sub-mean to mean strength are discussed, and data are given for various types of yarns.

311. COTTON YARNS: TWIST, STAPLE LENGTH AND BEHAVIOUR IN WEAVING. (*Spinner u. Weber*, 1939, 57, 23-26. From *Summ. of Curr. Lit.*, xix., 17, 1939, p. 494.) The influence of twist on yarn strength is discussed, and derivation of the expression $\text{twist} = \text{twist factor} \times \sqrt{\text{counts}}$ is explained, and the twist factor and yarn characteristics on which it is dependent are discussed. The applicability of the equation is considered and various modifications and corresponding nomograms are given. Brandt's work on yarn twist and strength, and the work of Morton and Pollard on the relation between yarn twist and end breakage in weaving, are discussed.

312. EMPIRICAL RELATIONSHIPS BETWEEN COUNT, TWIST AND STRENGTH OF COTTON YARNS. By N. Ahmad and V. Venkataraman. (*Tech. Bull. Ser. A*, No. 48. Ind. Cent. Cott. Comm., 1939.) Pt. I., COUNT—SINGLE THREAD TEST. Describes a formula that has been developed by which it is possible to predict and estimate the single thread strength of any desired count from that of a known count spun from Indian cottons. The limitations of the formula are discussed.

Pt. II., TWIST STRENGTH.—Gives the results of an investigation carried out to discover the limiting twists for the different counts of (i.) short-medium staple, (ii.) medium-long staple, and (iii.) long-staple Indian cottons, which would yield the best strength results. The investigation was restricted to the variation of twist in the ring-frames only.

313. HEAT-RESISTANT COTTON YARN AND CORD: PRODUCTION. By R. B. Newton *et al.* (Georgia, U.S.A. From *Summ. of Curr. Lit.*, xix., 15/16, 1939, p. 453.) Heat-resistant cotton yarn is obtained by saturating cotton yarn with water or other liquid that does not destroy or coat the cotton, to soften the natural gums and waxes, and twisting and stretching the yarn while in a saturated condition, the stretching being effected during and after the twisting. Stretching is effected to such an extent that the yarn is under tension just short of the breaking point. A further improvement in the properties of the yarn is produced by compressing the twisted and stretched yarn. Heat-resistant cord is obtained by cabling yarns made in the way described above while still in a saturated condition, and stretching the cord while wet either during or after cabling. The cord may also be compressed. It is claimed that the yarn has substantially a constant strength during all changes of moisture content from

normal to bone-dry, and a substantially lower stretch and diameter than normally processed cotton yarn or cord containing the same quantity of cotton per unit length. The results of tests are given.

314. PIMA COTTON YARNS: SPINNING. Victor Ring Traveler Co. (*The Traveler*, **87**, 1939, p. 8. From *Summ. of Curr. Lit.*, xix., **13**, 1939, p. 381.) Various problems and improvements in carding, drawing, and speed frame processes are discussed, with special reference to the use of high drafts. Details are given of improved spinning plans.

315. THE SPINNING AND DOUBLING OF COARSE COTTON YARNS. By C. Draper. (*Text. Wkly.*, xxv., 1940, pp. 220 and 250.) A report of a lecture in which practical advice is given on the opening and mixing, carding, drawing, speed frames, ring spinning, winding and doubling processes in the production of coarse yarns, and the general factors aiding efficiency. A discussion is reported.

316. NEPS IN COTTON. (*Bull. No. 396*, U.S. Dept. of Agr. From *Int. Cott. Bull.*, xvii., **67**, 1939, p. 319.) This publication, entitled "Neps and Similar Imperfections in Cotton," defines the term "nep" as follows: "Most of the small imperfections can be divided into two groups, neps proper and particles of seed coat. Proper neps are only tangled fibres. Thin-walled fibres enter into the greatest number of neps and thick-walled fibres into the least. Seed-coat particles are of two kinds—small pieces torn from the chalazal end of mature seeds and mote fragments crushed during ginning. Neps in any given sample may be the result of the combined influence of at least two main factors—namely, characteristics and type of treatment. No essential difference has been found between the composition of neps in ginned cotton and those in products of manufacture. The number of neps appears to have increased during manufacturing processes. Fifteen kinds of neps are differentiated according to the type or types of fibres contained in the composition. One authority even considers neps in yarn to consist of all faults which are due to the presence of any material or fibre not normal cotton." This definition of neps is rather broad, but useful to the carder and others. It is common knowledge that careless picking, faulty ginning, inefficient scutching, and poor carding will increase neppiness in a mixture; but it seems inconceivable that drawing, drafting on the fly frames, and spinning of the cotton can increase neps. Examination of waste from any of these processes will show that neps are removed during processing. The only solution to test the efficiency of the card would be to test the amount of neps in the lap and compare with the amount in the web at the front, and a method to accomplish this is described.

317. OPENING AND CLEANING PLANT: DEVELOPMENT. (*Text. Merc. and Argus*, Jubilee Souvenir, 1939, p. 27. From *Summ. of Curr. Lit.*, xx., **1**, 1940, p. 3.) An illustrated review is given of developments in the methods of opening and cleaning cotton by comparison with those used fifty years ago. The chief changes are those consequent on high-density baling of cotton and the substitution of automatic machinery for manual labour in mixing and blowing rooms.

318. COTTON OPENING AND CLEANING MACHINE. By L. Wild. (Bolton, B.P. 506,954 of 27/4/38, 7/6/39. From *Summ. of Curr. Lit.*, xix., **14**, 1939, p. 415.) A machine for cleaning and opening cotton comprises a revolving beater that comes partly in the path of the cotton on its way to a revolving suction cage and beats up the cotton that passes directly to it and strips cotton from the cage, the whole of the cotton being beaten against a grid on an air box, the fibres then passing to the suction cage at its lower side between a travelling lattice and

the cage, and being delivered from the machine by the lattice. Suction is applied to the air box to remove dust.

319. THE RECTIFINDER. (Manufd. by R. Leech Ltd., Altrincham, Cheshire. From *Int. Cott. Bull.*, xvii., **68**, 1939, p. 513.) Describes an instrument for examining textile materials and fabrics. It is available in two forms: a portable electric dry battery model, and a mains model. Spinners are using the apparatus to inspect card webs for neps and impurities, and for testing rovings and yarn, by inspection for snarls, twist, thick places, counts, and spinning variations. It is also useful in connection with wool, real silk fibres, and rayon. In the weaving shed all faults in weft, warp, etc., can easily be detected.

320. RUST-RED COTTON: EXAMINATION. By – Haller. (*Textilberichte*, **20**, 1939, p. 362. From *Summ. of Curr. Lit.*, xix., **13**, 1939, p. 402.) The abnormal resistance to bleaching shown by a sample of Blue Benders cotton which had been damaged by frosts is mentioned, and a detailed account is given of the examination of a rust-red sample of cotton of *Gossypium barbadense*, L., which in many respects resembled a good Texas cotton of *G. hirsutum*, L. The coloured cotton was examined under the microscope, subjected to tests with copper ethylenediamine, ruthenium red, safranin, and ferric chloride-ferricyanide, scoured and bleached and again submitted to the colour reactions. An abnormally high loss in weight in scouring was observed. Impurities removed in the scouring treatment were isolated and examined. The results indicated the presence of aromatic substances having diazotizable amino groups. Difficulties that would be encountered in the processing of materials containing such abnormal cottons are discussed.

321. SHIRLEY MOISTURE METER. (*Text. Wkly.*, **24**, 1939, p. 745. From *Summ. of Curr. Lit.*, xx., **2**, 1940, p. 31.) The Shirley Moisture Meter comprises an electrode system for measuring the electrical resistance of a sample of cotton and an indicating system which indicates the moisture regain of the sample directly. The electrode system consists of a cylindrical stainless steel core surrounded by ebonite and enclosed in a nickel sheath. It is pressed on to the sample with a force of about 45 lb. A mechanical constant pressure device has been designed in order to relieve the fatigue to a routine tester. The electrical resistance measured is that of the cotton bridging the gap between the inner core and the outer sheath of the electrode system. An amplifying valve is employed to build up the current and make possible the use of Record "Circscale" indicators, which have easily read circular scales and give accurate readings over clearly marked dials. The apparatus is portable and may be worked from any ordinary A.C. electrical supply. It can be used for measurements on raw cotton and on grey cotton yarns in any form of package over a range from 4.5 to 15 per cent. regain. With the aid of conversion tables the instrument can also be used for testing bleached cotton and yarn, cotton cloths in various states of finish, and also various other textile materials with the exception of silk or acetate rayon. Oven and meter tests on a large number of cottons and yarns have demonstrated the essential accuracy of the Moisture Meter.

322. SPINNING ROOM HUMIDITY. By H. L. Kempaner. (*Text. World*. From extract in *Int. Cott. Bull.*, xvii., **68**, 1939, p. 501.) In the spinning of fine yarns from long staple cotton 60 to 65 per cent. relative humidity is necessary. When shorter staple cotton is used in the spinning of fine yarns considerably more twist would be required for adequate strength and proper spinning, and a relative humidity of 65 to 70 per cent. would be desirable. To obtain proper humidity in a spinning room there is more to consider than the mere adding of moisture to the air. The correct distribution of conditioned air is of primary importance to dissipate the relatively large internal heat load imposed by the

machinery, in order to maintain a desirable condition of comfort for the employees and assure a greater uniformity of relative humidity throughout the entire spinning room, and especially between the frames. The distribution is accomplished most economically with the combination split-type system, which combines the best features of a central-station system and an atomizer spray-type system. This has been in operation for some twenty-five years, the earliest applications being made for weaving or other processes which required comparatively high humidities. At relative humidities below 65 per cent. the split system is more expensive than straight central-station type systems; at above 65 per cent. it is less expensive.

TRADE, PRICES, NEW USES.

323. COTTON—FROM RAW MATERIAL TO FINISHED PRODUCT. (Pubd. by the Cotton Textile Inst., 330, Broadway, New York, U.S.A., 1939. Price 60 cents, postage extra. From *Text. Wkly.*, xxv., 599, 1939, p. 250.) "A compendium which traces through every manufacturing process in the cotton trade, defines the objectives of the processes and the results achieved." Includes a bibliography of cotton and 64 samples of standard cotton fabrics.

324. WORLD COTTON OUTPUT IN 1938-39. (*Text. Wkly.*, xxv., 635, 1940, p. 215.) According to a review of the 1938-39 cotton season contained in the twelfth Cotton Year Book of the New York Cotton Exchange, world production was roughly 25 per cent. less than in 1937-38, dropping from 36,784,000 to 27,407,000 bales, the greatest decrease being in the United States. World consumption of cotton in 1938-39 totalled 28,513,000 bales, compared with 27,746,000 in the previous season. World carry-over at the end of the season was 21,462,000 bales, compared with 22,639,000 bales at the end of 1937-38. Records for 1938-39 showed a large increase in the spinning of cotton in the United States, only slight changes in Great Britain, Europe, and Russia, and moderate decreases in the Orient and elsewhere.

325. WORLD COTTON CROP: PROSPECTS, 1939-40. By I. Salto. (*Int. Rev. Agr.*, Rome, 30, 1939, p. 1014. From *Summ. of Curr. Lit.*, xxi., 1, 1940, p. 1.) A table of the estimated world cotton consumption is given for the years 1926-27 to 1938-39. The world's production for 1939-40 is put between 6,000,000 and 6,200,000 tons, against 6,100,000 tons in 1938-39 and an average of 6,350,000 tons in the preceding five years. With the addition of a carry-over of 4,800,000 tons total supplies may reach 10,800,000 to 11,000,000 tons against 11,100,000 and 11,200,000 tons in the last two years. This total includes 5,800,000 tons of American cotton, of which 2,550,000 tons are held by the Government. A consumption of 6,000,000 to 6,200,000 tons is forecast for next year with the same carry-over as in 1938-39.

326. WORLD COTTON SITUATION: OUTLOOK FOR 1940. (U.S. Bur. of Agr. Econ. *Text. Wkly.*, xxv., 1940, pp. 39 and 68.) Reviewed in the light of statistical tables for the years 1924-25 to 1939-40: Table I. commercial production of American and other cottons, mill consumption, carry-over; II. world carry-over; III. production; IV. supplies; V. consumption; and VI. exports of American, Egyptian, Indian and other growths.

327. COTTON STATISTICS. By J. A. Todd. (*Text. Manufr.*, lxxv., 1939, No. 779 and subsequent issues.) The first article in this series contains tables of the world's cotton crops; areas, yields, and prices of American, Indian and Egyptian crops; world's cotton consumption, and world's carry-over of American and Egyptian cotton during the period 1914-39. Long-distance trends, and the possible effects of the war on supply and consumption, are discussed. The

outstanding feature of the world's cotton crops during the period is the decline in predominance of American cotton and the increasing importance of Outside Growths. World consumption of all kinds of cotton has, on the whole, increased since 1912-13. American carry-over figures show enormous totals for the last two years. There does not appear any likelihood of a shortage of world supplies or of a collapse in either production or consumption of cotton as a result of the war.

The second paper includes tables giving fuller details of the Outside Growths and the Empire crops at five-year intervals from 1914 to 1939, and for every subsequent year. Table III. gives the world's consumption of cotton by groups of countries for the past ten seasons and for the first half of 1938-39. Table IV. is a record of the highest and lowest futures prices of American cotton in New York and Liverpool, and of Egyptian in Liverpool, from 1927 to 1939, and monthly from August, 1938, to November, 1939.

The third paper contains statistics of new varieties of Egyptian cotton, seasonal movements of the American crop, and price trends of American and other growths.

The fourth paper includes the following tables: Egyptian crop—Government estimates and period ginnings; Brazil cotton crop; World's cotton consumption (Garside); Sudan cotton crop; Weekly high-low futures prices of American cotton in New York and Liverpool, Egyptian cotton in Liverpool and Alexandria, and Broach cotton in Bombay, since the beginning of the season.

The fifth paper includes statistics of the cotton crops of Asia Minor and Europe; cotton imports and exports; Indian crop; spot prices of American cotton, with other varieties as percentages of American.

328. STATISTICS ON COTTON AND RELATED DATA. By M. R. Cooper. (U.S. Dpt. Agr., Bur. Agr. Econ., Washington, D.C., 1939.) Tables of statistics are included for acreage, production, exports, mill consumption, carry-over, prices, etc., for cotton in the United States and other countries, over varying periods of years. Statistics are also given for cotton textiles and manufactures, cotton seed and cotton-seed products.

329. BUDGETARY CONTROL IN INDUSTRY: APPLICATION TO THE TEXTILE TRADES. By K. Italiener. (*Text. Wkly.*, 1939, **23**, p. 860; **24**, pp. 13 and 47.) An explanation of the system of "budgetary control" based on the requirements of a medium-sized mill with 50,000 spindles and 400 looms, spinning from 16's to 42's and weaving grey cloth.

330. COTTON BUILDING INSULATION MATERIAL: APPLICATION. By D. F. Forwood. (*Text. World*, **89**, 11, 1939, p. 107. From *Summ. of Curr. Lit.*, xix., **23**, 1939, p. 692.) For use as a building insulation material cotton is subjected to a new patented process of fireproofing. Cotton lint is made up into batts and stitched to a backing by a multiple-needle machine. In use this is tacked along the edges to wall studding. Tests have shown that houses insulated with "Insul-Cotton" remain 10 to 13° cooler during the day than houses not insulated and 2 to 3° cooler than houses insulated with a mineral material.

331. COTTON-SEED HULLS: INDUSTRIAL USES. By D. M. Musser and R. F. Nickerson. (*Ind. Chem. Eng.*, **31**, 1939, p. 1229. From *Summ. of Curr. Lit.*, xix., **23**, 1939, p. 663.) As part of a broad research programme to develop uses for the cotton plant, the available information regarding cotton-seed hulls is summarized. The material is at present mainly a waste product worth only 5 to 6 dollars per ton, but it makes up about one-third weight of the crop. Its chemical composition is given. Suggested uses include carbonization and fermentation, production of furfural, xylose and quality cellulose, and as cattle feed, fertilizer and stuffing.

332. COTTON PLANT: PULPING WITH CHLORINE. By D. R. Milne and F. K. Cameron. (*Ind. Eng. Chem.*, **31**, 1939, p. 1076. From *J. Text. Inst.*, xxx., **11**, 1939, A689.) The relatively low proportion of α -cellulose obtained in pulping with chlorine shows that this procedure is too rigorous for whole cotton—probably because the lint and cusps are too long in contact with the chlorine—and does not appear to be a practical or economical operation.

MISCELLANEOUS.

333. THE INFLUENCE OF SCIENCE ON THE COTTON INDUSTRY. By F. C. Toy. (*J. of Text. Inst.*, xxx., **9**, 1939, P387.) A report of a lecture delivered at a Joint Meeting of the British Association for the Advancement of Science and the Manchester Literary and Philosophical Society in June, 1939. The history of the cotton industry from the point of view of the influence of science would appear to fall into four natural divisions. The first, which lasted about 150 years, may be called the pre-scientific period; the second, lasting about 120 years, the age of mechanical and scientific advances; the third, of roughly 60 years, a period of expanding trade at home and abroad; and the fourth period—modern times—may be said to comprise the present century. An interesting account is given of each of these periods.

334. SKINNER'S COTTON TRADE DIRECTORY OF THE WORLD, 1939-40. (Pubd. annually in October by Thos. Skinner and Co. [Publishers] Ltd., London, Manchester, Bradford, New York, and Montreal.) The seventeenth issue of this invaluable work contains information relating to the cotton industry in every country in the world. The customary revision of details, in collaboration with the leading Textile Associations throughout the world, was carried through prior to the declaration of war in Europe. The conditions prevailing in the Far East again precluded the revision of information relating to China and Japan. The Hosiery and Knit Goods Manufacturers Section has been completely revised and materially extended, and contains lists of cotton, silk, rayon, woollen and worsted hosiery yarn spinners and doublers, hosiery yarn and fabrics dyers and finishers; goods manufactured; and also information concerning hosiery machine and accessory manufacturers. This section is also published at a nominal price as a separate volume in order to meet the requirements of this specialized branch of industry. The thumb-holes for ease of reference are labelled: Contents; Index; Exporters; Merchants; Spinners, Manufacturers and Doublers; Directors (British); Dyers, Finishers; Fabrics; Silk and Rayon; Hosiery and Knit Goods; Mill Supplies. All headings, indices, and explanatory notes are printed in English, French, German, Italian, Spanish, and Portuguese. To all those concerned in any way with the cotton industry this directory is absolutely indispensable. The price by post, inland and abroad, is £1; Canada and United States, \$7 (post and duty free).

ADDENDA.

335. INSTITUTE OF PLANT INDUSTRY, INDORE: PROGRESS REPORT, 1939. Pure *desi* and Cambodia cottons have been extensively tested, and are now undergoing distribution. Wilt is causing trouble on the farm. The research on the genetics and physiology of cotton is outlined. Useful results have been obtained in manurial trials.

336. PUNJAB: ANNUAL REPORT OF DEPT. OF AGRICULTURE, 1938. (Received 1940.) The Punjab-American strain 289-F/43 was expected to occupy more than 100,000 acres in 1938-39. The increase of the *desi* strain 39-Mollisoni over the four

years of its existence is described as spectacular; it is the best strain for the canal colonies. Sanguineum cotton for the south-west has been improved through the isolation of 119, which yields well, gins 38 per cent., and has become very popular. Its earliness allows of its being followed by a successful wheat crop, a matter of great economic importance. Observations have been made on the carrying over of the cotton root-rot fungus. An experimental clean-up campaign against spotted bollworm was carried out on a large scale with successful results. The programme of research work to be undertaken by the Cotton Botanist is outlined.

337. DESTRUCTIVE AND USEFUL INSECTS. By C. L. Metcalf and W. P. Flint. (McGraw-Hill Pubg. Co. Ltd., Aldwych House, London, W.C. 2, 1939. Price 50s.). This work of close upon 1,000 pages is a completely revised second edition of a textbook of entomology intended for students taking introductory courses in the subject, and as a guide or reference book for farmers, gardeners, fruit-growers, physicians, and others concerned. The first ten chapters provide a general and technical introduction to the science: the section on direct measures of control is particularly full and useful.

The second half of the book discusses the insect pests of plants and animals in the U.S.A. Keys are supplied for their identification, and the more important are described. In the short chapter on cotton diseases the statement still passes current that *Dysdercus* "puncture the seeds in the developing boll and cause a juice to exude that stains the lint." There is no mention here or under the general heading of insect transmission of disease of the wide range of *Nematospora* infections.

The book contains an enormous amount of information, and unsparing industry has obviously been employed in its compilation. It could stand on few shelves where it would not frequently be found useful for reference. As a standard work, however, it falls between two stools in attempting to serve the dual and incompatible purposes described in the opening sentence above.

338. NEW POLYPOIDS IN COTTON BY THE USE OF COLCHICINE. By S. C. Harland. (*Trop. Agr.*, xvii., 3, 1940, p. 53.) Four methods are enumerated which have given success in artificial production of polyploids in the genus *Gossypium*, and the characteristics of the resultant plants are described. Doubling of the chromosome number of the existing tetraploids is shown to be possible, but the prospect of improvement in this direction is doubtful. On the other hand, crossing *arboreum* with *Thurberi* (both $n=13$) and then doubling the chromosome number gives a virtual resynthesis of an amphidiploid genetically closely related to the modern tetraploids, and capable of hybridization with them. This opens up important possibilities in the introduction of resistance of various kinds.

339. A FURTHER REPORT ON ROOT-FORMING SUBSTANCES USED FOR PROPAGATION PURPOSES. By M. A. H. Tincker and C. H. Unwin. (Reprinted from *J. of Roy. Hort. Soc.*, lxiv. 12, 1939.) Records of experiments over a wide range of plants easy and difficult to propagate. The method is worth while even in the easy group, owing to the gain of time and to the better root systems formed. There remains a group in which no response has been obtained.

340. THE MICROBIOLOGY OF SILAGE MADE BY THE ADDITION OF MINERAL ACIDS TO CROPS RICH IN PROTEIN: I. QUANTITATIVE CHEMICAL AND BACTERIOLOGICAL DATA. By A. Cunningham and A. M. Smith. (*Coll. of Agr. Edinburgh*, 1939.) Considerable attention has recently been devoted to the possibility of preserving green fodder crops by addition of mineral acids. The aim of investigators in this field has been to raise the hydrogen-ion concentration of

the materials so rapidly and to such a level that losses of nutrients due to respiration of plant cells and activities of micro-organisms are greatly retarded or completely inhibited. In the experiments described from the College of Agriculture, Edinburgh, the Virtanen process, which involves the use of a mixture of hydrochloric and sulphuric acids, was employed. It was found that fodder crops containing over 3 per cent. of nitrogen or about 20 per cent. of crude protein can be successfully preserved by the addition of sufficient mineral acid to lower the mean pH to values between 3.0 and 4.0.

EMPIRE COTTON CROPS FOR THE YEARS 1929-39, EXCLUDING INDIA. (In bales of 400 lbs.)

The seasons are given as covering two years (e.g., 1928-1929) because in the majority of the countries named planting takes place in one calendar year and picking in the next. In a few of these countries, however (e.g., Tanganyika, Cyprus, Malta and some of the West Indian Islands), the crop is harvested in the same year as that in which it is planted. In such cases the figures should be read as relating to the crop grown and harvested in the latter of the two years at the head of the column.

COUNTRY.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.
(1) Anglo-Egyptian Sudan ..	161,536	157,769	120,310	234,964	137,384	157,625	296,131	248,285	332,687	331,639	331,104 (1)
(2) Uganda ..	204,057	129,969	191,305	203,265	294,828	285,986	253,242	321,348	338,391	417,179	298,893 (2)
(3) Kenya ..	1,984	1,518	783	1,744	4,276	6,749	8,773	15,783	22,166	19,610	13,000 (3)
(4) Tanganyika ..	27,785	23,135	11,351	18,039	30,834	39,009	58,540	67,369	61,783	44,643	66,637 (4)
(5) Nyasaland ..	6,095	9,331	4,205	5,067	5,942	10,713	21,006	13,730	13,908	17,358	5,276 (5)
(6) N. Rhodesia ..	—	—	—	—	—	—	—	—	—	43	77 (6)
(7) S. Rhodesia ..	280	1,481	1,974	579	355	689	566	329	530	338	82 (7)
(8) Union of South Africa and Swaziland											
(9) Nigeria ..	9,774	16,213	8,123	2,801	1,860	2,440	2,966	1,983	3,397	1,132	747 (8)
(10) Gold Coast ..	32,126	43,925	18,850	6,350	24,366	28,247	58,831	60,076	47,554	31,636	24,057 (9)
(11) Cyprus ..	296	200	297	263	68	144	146	128	145	4	5 (10)
(12) Malta ..	3,520	4,718	2,865	1,119	913	1,865	5,214	2,993	4,670	2,151	1,705 (11)
(13) Iraq ..	379	293	201	41	34	32	20	32	32	26	28 (12)
(14) Ceylon ..	4,700	3,300	960	409	*	—	—	—	—	—	— (13)
(15) Queensland ..	380	248	95	47	34	92	124	293	369	355	196 (14)
(16) Fiji ..	6,296	13,999	12,228	4,975	13,903	21,924	17,653	16,631	10,649	11,935	13,457 (15)
(17) West Indies ..	271	398	266	90	8	39	29	64	65	60	7 (16)
	5,377	5,672	5,106	2,524	2,614	3,618	4,720	4,565	4,676	6,196	5,636 (17)
	464,856	412,169	378,919	482,277	517,419	559,172	727,981	753,609	841,022	884,305	762,907
		Percentage Decrease 11.3	Percentage Decrease 8.0	Percentage Increase 27.3	Percentage Increase 7.3	Percentage Increase 8.0	Percentage Increase 30.2	Percentage Increase 3.5	Percentage Increase 11.6	Percentage Increase 5.1	Percentage Decrease 13.7

* No longer included in Empire figures.

THE EMPIRE COTTON GROWING REVIEW

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No. 2

ABSTRACTS OF CURRENT LITERATURE

COTTON IN INDIA.

341. LIST OF COTTON PRESSING FACTORIES, WITH NAMES OF OWNERS AND PARTICULARS OF MARKS ALLOTTED TO THEM IN THE DIFFERENT PROVINCES OF BRITISH INDIA AND CERTAIN INDIAN STATES, FOR THE SEASON 1939-40. (No. 3607. Obtainable: Manager of Publications, Delhi. Price As. 12. or 1s.)

342. REPORT ON THE STAPLE LENGTH OF THE INDIAN COTTON CROP OF THE 1939-40 SEASON. (*Stat. Lfht.*, No. 1, 1940. Ind. Cent. Cott. Comm.) The crop of 1939-40 is estimated to produce in bales of 400 lb.:

Long staple, over 1 inch	..	..	..	66,000
Medium staple, $\frac{3}{4}$ to 1 inch	..	..	..	1,818,000
Short staple, below $\frac{3}{4}$ inch	..	..	..	3,100,000
Grand total	..	..	..	4,984,000

343. AGRICULTURE AND ANIMAL HUSBANDRY IN INDIA, 1937-38. (Manager of Pubns., Delhi, 1940. Price Rs. 5-14 or 9s. 3d.) The report deals with agricultural conditions in India during 1937-38; economic work on crops; research on crop production; agricultural marketing and engineering; animal industry; veterinary research and livestock improvement; agricultural education; the co-operative movement as affecting agriculture, etc. Statistics are included of cotton acreage, production, and exports. The research schemes financed by the Indian Central Cotton Committee, and the work of the Technological Laboratory, Matunga, and of the Institute of Plant Industry, Indore, are discussed.

344. SCIENTIFIC REPORTS OF THE IMPERIAL AGRICULTURAL RESEARCH INSTITUTE. NEW DELHI, 1938-39. (Manager of Pubns., Delhi, 1940. Price Rs. 3-3, or 5s. 3d.) A report of the research work carried out in 1938-39. Cotton is not included.

345. INDIAN CENTRAL COTTON COMMITTEE. (*Ann. Rpt. to Aug.*, 1939. Received 1940.) A record of steady progress. During the year thirty-seven research schemes, fifteen seed extension and marketing schemes, and four nuclei schemes were sanctioned at an estimated cost of Rs. 5,56,761. In addition, Rs. 1,89,123 and Rs. 1,11,000 were sanctioned for the Technological Laboratory, Matunga, and the Indore Institute of Plant Industry respectively. Four research students were under training, two in India and two in England. The various Acts passed for the control, transport, ginning and pressing of cotton functioned satisfactorily.

Three new markets were established under the Bombay Cotton Markets Act—at Hubli, Gadag, and Nargund—bringing the total number of such markets to twelve. Much useful work was carried out at the Institute of Plant Industry, Indore, in connection with cotton genetics, physiology, manuring, breeding and selection, varietal trials, and seed distribution. A steady increase was recorded in the activities of the Technological Laboratory at Matunga; 635 routine samples were received for tests during the year, representing an increase of 17 per cent. over last year's figure. During this period also fibre and spinning tests were made on eight samples of cotton received from the Senior Botanist, Bukalasa Experimental Station, Uganda. Investigation work was continued in connection with the following pests and diseases: stem weevil, pink bollworm, jassid, black-headed cricket, and root-rot and wilt diseases.

348. INDIAN CENTRAL COTTON COMMITTEE. The report of the 41st meeting, held at Coimbatore on January 19 and 20 last, contains the presidential address, and summaries of the final or progress reports of the many research schemes financed by the Committee. These include schemes in connection with cotton breeding, seed distribution and extension, the control of pests and diseases, and recommendations for new research.

347. INDIAN HAND-LOOM INDUSTRY: ACTIVITY. Bombay Econ. and Indus. Survey Committee. (*Ind. Text. J.*, 50, 1940, p. 200. From *J. Text. Inst.*, xxxi., 7, July, 1940, A373.) A series of questions and answers supplied by the Bombay and Ahmedabad Millowners' Association are reproduced concerning the economic relations between the power-loom and the hand-loom weaving industries in India. Fields in which the hand-loom industry has advantages are indicated.

348. SPINNING TEST REPORTS ON INDIAN COTTONS, 1939-40. By N. Ahmad. (*Tech. Circs.*, Nos. 415-26, 428-9 and 432-5. 1940. Ind. Cent. Cott. Comm.) The circulars contain the grader's report and spinning test results for Jagadia, Broach, Surat, Navsari, Ujjain, Miraj, Westerns, Bailhongal and Tiruppur Cambodia cottons, and the report of the Standards Committee and spinning test results for Berar, C.P. No. 1, P.A.289F, P.A.4F, Latur, Sind Sudhar, Khandesh, Broach, and L.S.S. cottons for the 1939-40 season.

349. TECHNOLOGICAL REPORTS ON INDIAN COTTONS, 1939-40. By N. Ahmad. (*Tech. Circs.*, Nos. 427, 430-1, 436. 1940. Ind. Cent. Cott. Comm.) The particulars given include agricultural details, grader's report, fibre particulars, spinning test results, remarks and conclusions.

Verum 262.—The 1939-40 cotton shows good improvement in length, but is coarser. Suitable for 28's warp.

Late Verum (Nagpur).—The yarns are somewhat neppy. Suitable for 29's warp.

Umri Bani.—The cotton contains a fair amount of trash, and would gain by being picked in a cleaner state. Suitable for 27's warp.

Verum 262 (Akola).—Yarns are slightly neppy. Suitable for 30's warp.

350. BOMBAY: FINAL REPORT OF THE BOMBAY COTTON FORECAST IMPROVEMENT SCHEME, 1934-39. (Br. Ind. Press, Bombay, 1939. Price Re. 1.) This scheme was financed by the Indian Central Cotton Committee for a period of five years (1934-39). The cotton crop forecast estimates are based on the three factors of area, anna valuation, and standard yield per acre, and the defects discovered under these heads are dealt with. The work in connection with the scheme has brought home the necessity of (a) collecting data from supplementary sources such as the estimates made by commercial firms like Volkart Bros., Ralli Bros., etc., study of arrivals of cotton at up-country markets, of yield obtained on

Government farms and other places, of discussions with experienced Revenue and Agricultural Officers and cultivators, of seeing the cotton crop in person, etc.; and of (b) the application of a correction factor from past experience to the anna valuation.

351. COTTON BREEDING AT SURAT. (*Ind. Farmg.*, i., 5, May, 1940, p. 234.) The cotton-breeding work at Surat aims at evolving improved varieties for South Gujarat, comprising an area of about 600,000 acres and producing some 150,000 bales of lint of 400 lb. Cotton forms an important money crop of the tract and occupies from 25 to 40 per cent. of the total cultivated area. The variety grown belongs to the species *Gossypium herbaceum* var. *frutescens*, and is a long-season one occupying the land for about nine months. Soils are deep black and highly retentive of moisture. The average rainfall is 35 to 40 inches, mostly received from June to October; the rains are assured and the occurrence of frost is rare. The first efforts to improve the cotton of this tract date from 1884, when attempts to introduce American types were made. The work has been continued on and off since, and in 1923 the improved type 1027 ALF was distributed, and has covered nearly 40 per cent. of the total cotton area of the district. Further promising strains are being tested, and efforts are also being made to evolve a type immune to wilt disease, which is gradually spreading in South Gujarat.

In the past attempts at hybridization of Old and New World cottons were made by a number of workers, but in the main these failed, and when rare hybrids were obtained they proved sterile. No progress was achieved until reports of inducing fertility by back-crossing to New World cottons came from Russia and from Dr. Harland after 1929. Experiments were made at Surat and as a result of large-scale crossing work during 1934-39, 40 F_1 hybrids between Old and New World cottons were obtained. They all proved sterile as usual, but as a result of back-crossing with the New World cottons as pollen parents a number of first back-crosses were raised, and the fertility in these varied from full fertility to complete sterility. Individual plant selections from the progeny of the first back-crosses are being made, keeping in view the aim of combining the adaptability and disease resistance of Asiatic cottons with the superior fibre qualities of New World cottons. Further attempts to induce fertility in the sterile F_1 hybrids between Asiatic and New World cottons by inducing chromosome doubling by colchicine treatment have given encouraging results.

352. MADRAS: COTTON CULTIVATION, 1938-39. (*Rpt. Operns. Dpt. Agr. Madras*, 1938-39; recently received.) Attention has been paid to hybridization and back-crossing with a view to evolving a strain of cotton with a staple length of 28 mm., high ginning outturn and heavy yield. At the Coimbatore Station a large number of crosses were made between Co.2 and foreign cottons, and some promising strains were obtained. In tests carried out on black cotton soils the most satisfactory results were obtained with the strain N.3-2/14. At Kovilpatti, K.1 still retained its superiority over other varieties. Experiments carried out at Hagari Station indicated that only crosses between H.1 and 1027 ALF appeared to have any future. Cambodia has done well at this Station during the past three years when sown in July and August under irrigated conditions. At Nandyal N.14 retained its superiority over other varieties. At Guntur the strain 779 proved more successful than all other strains tested.

353. COTTON CULTIVATION, 1939-40. (*Madras Agr. J.*, April, 1940, p. 146.) The area under cotton in January was estimated at 2,102,900 acres, compared with 1,873,900 acres for the corresponding period last year, the increase amounting to 12.2 per cent. The increase in acreage was attributed to the favourable rains and good prices during the sowing season.

354. SIND: COTTON CULTIVATION. By T. J. Mirchandani. (*Ind. Farmg.*, i., 6, June, 1940, p. 290.) The expansion in the cultivation of cotton has exceeded expectations, especially in regard to the cultivation of long-stapled American cotton, which has risen from 8 per cent. in 1932 to 65 per cent. in 1937-38. New strains have been evolved by the Dept. of Agriculture—Sind Sudhar (289F-1) for the left bank and 4F-98 for the right bank. The former yields 8-10 maunds per acre, has a staple of 1 inch, ginning outturn of 30, and spins 43 counts. 4F-98 yields 6-8 maunds per acre, has a staple of $\frac{7}{8}$ to $1\frac{1}{8}$ inch, a ginning outturn of 34, and spins 36 counts. The improved *desi* cotton, Sind NR (27 WN), evolved by the Department has a yield of 8-10 maunds per acre against the pre-Barrage variety, which gave 4-5 maunds per acre. The work on Egyptian and high-quality cotton is in progress at Mirpurkhas in Tharparkar district, where climatic conditions are more suited to these cottons. Two varieties, Boss III-16 and Sea Island, spinning 80 and 74 counts respectively, and both with a staple of $1\frac{1}{4}$ inches, are being grown on a small scale.

355. KARACHI COTTON ASSOCIATION, LTD. We have received a copy of the illustrated brochure published by the Association, summarizing the work carried out in connection with the Karachi cotton industry during the past twenty-five years.

356. KARACHI COTTON ANNUAL, 1938-39, No. 6. (Pubd. by Karachi Cotton Asscn., Ltd. Price Rs. 2.) A useful compendium of all matters relating to the Karachi cotton trade, with particular reference to Sind, the Punjab, United Provinces, and Rajputana. Many statistical tables and charts are included of cotton crops, exports, prices, stocks, consumption, etc.

COTTON IN THE EMPIRE (EXCLUDING INDIA).

357. BRITISH COTTON GROWING ASSOCIATION. The thirty-fifth Annual Report to December 31, 1939, contains much useful information in connection with the Association's work throughout the year. Details are given of the work of the B.C.G.A. (Punjab) Ltd., followed by sections devoted to the West Indies, Nigeria, Kenya Colony, Uganda, Tanganyika Territory, Nyasaland, South Africa, Northern and Southern Rhodesia, and the Sudan. The Association's ginning and baling machinery, buildings, and other equipment in Nigeria, Uganda, Nyasaland, etc., were maintained in a state of high working efficiency. There were no major extensions at the ginning factories during the year. Appendices included in the Report contain statistics of Empire cotton crops, world's cotton crops, and the Egyptian cotton crop.

358. ASIA. COTTON IN BURMA. (*Rpt. on Progress of Cott. Work in Burma, 1938-39.* Rangoon, 1939.) Some 150,000 acres are under cotton cultivation in Burma, and this would appear to be the limit of expansion. The two varieties cultivated are Wagale and Wagyi, the former in the Dry Zone, and comprising approximately 90 per cent. of the total area under cotton; the latter in the district of Thayetmyo. Research on the improvement of Wagale cotton is being carried out at the Mahlaing Central Farm, where two promising strains have been evolved of which the staple and spinning performance have been favourably reported on in the United Kingdom. Experiments have been conducted in Thayetmyo with a view to the improvement of Wagyi cotton, but little success has been achieved up to the present, and the work will be continued. The total exports of cotton from Burma during the 1938-39 season amounted to 93,357 bales of 400 lb.

359. CENTRAL AMERICA. HONDURAS: COTTON CULTIVATION. (*Cott. Lit.*, x., 7, July, 1940, p. 394.) The Government of Honduras has announced that it will distribute cotton seed free to farmers in order to increase the volume of cotton grown in the country. For several years cotton has been grown in small quantities

in various parts of Honduras, but cultivation has barely passed the experimental stage.

360. AFRICA. NIGERIA: COTTON INDUSTRY, 1939-40. (*Half-yrly. Rpt. Dpt. Agr., Nigeria. March 31, 1940.*) *Northern Provinces.*—The total quantity of American cotton purchased for export was more than double that of the previous season, and only some 3,500 bales short of the record crop of 1934-35. These figures represent a very satisfactory revival of cotton production for export, and there is every reason to hope that it will be maintained during the forthcoming season. This sudden and big increase in production for export was chiefly due to the rise in price combined with favourable climatic conditions. The latter resulted in yields which were generally above average. The total amount of seed distributed in 1939 was 4,724 tons, which was $5\frac{1}{2}$ per cent. more than in 1938, but whereas the return in bales of lint per ton of seed in 1938 was 4.38 bales, in 1939 it rose to 9.84 bales. Weather conditions throughout the cotton belt were on the whole very favourable. As a result of the low rainfall in June sowing was delayed in most areas, but this was more than offset by well-distributed late rains in September and October, and by the absence of severe harmattan. Although the late rains resulted in increased yields, the quality of the early pickings was impaired by a considerable quantity of stained cotton, and this, coupled with the further tightening up of the grading by the cotton examiners, resulted in the proportion of Grade II cotton being greater than usual. The sharp rise in price was the main cause of the increase in the quantity of cotton purchased. At the main markets the price opened at 1d. per lb., rose to 1.4d. per lb. in early January, and closed at 1.1d. per lb. An increased demand for seed is anticipated for the 1940-41 season.

Southern Provinces.—Only 11 tons of Ishan seed were sold for planting in 1939, compared with 31 tons in 1938. This fall was due to the great drop in prices in recent years, which had rendered cotton growing unremunerative. The present season's yield will be still further reduced by attacks of *Helopeltis*, which has proved more prevalent than ever before since the introduction of Improved Ishan cotton. In many farms the entire crop has been destroyed. It is estimated that the total production in the Southern Provinces for the 1939-40 season will be about 1,500 bales. This will include a certain amount of cotton grown last season which, on account of poor prices, was not brought to the market then, but which will no doubt be marketed this year.

361. PRIMITIVE FARMING IN NIGERIA: THE MUMUYE TRIBE. By E. R. Russell. (*Emp. J. Exp. Agr.*, January, 1940, p. 51.) Pagan methods of farming vary with each tribe. In this paper the methods of the Mumuye tribe are described; these may be taken as typical of pagan farming in Northern Nigeria. A very interesting account is given of the inheritance and tenure of the land, tribal cults, the system of cultivation practised, crops grown, etc. The paper is furnished with several illustrations.

362. NORTHERN RHODESIA: COTTON CULTIVATION, 1938-39. (*Ann. Rpt. Dpt. Agr.*, 1939.) Cotton in the railway belt of the Plateau regions was a complete failure owing to the incessant rain in the early part of the year. In the Mumbwa area also, although the season was a little better, the yields were very low. After three years of trial, two of which were quite remunerative, growers remained lukewarm even though cotton provides a much-needed cash crop. Cotton cultivation in both these areas has been suspended for the time being. In contrast with the situation on the Plateau, cotton was very successful in the Zambesi and Luangwa valleys. In the former the average yield was 463 lb. seed cotton per acre. Keeness is becoming apparent in the Luangwa valley and the number of growers is increasing.

363. SOUTHERN RHODESIA: COTTON INDUSTRY, 1938-39. (*Rpt. of Secy. Dpt. Agr. and Lands, 1939.*) The season was not a favourable one for cotton owing to excessive rainfall, which resulted in reduced yields and inferior quality lint and seed. Native production suffered more in proportion than did European crops. An officer of the Native Department was seconded for a period of three months to tour certain Native Reserves with a view to stimulating production by natives. Judging by the applications for seed the tour was highly successful, but it remains to be seen whether all the recipients will plant the seed. At Gatooma the unfavourable season proved the merits of the 7.L.1 strain, which is being increased for commercial production. This is followed closely by 7.L.5, which is being retained for re-selection purposes.

In compost trials, good breakdown of compost was obtained by using 40 parts by weight of soil to 100 parts of farm waste. Sufficient quantities are made to allow one-third of the arable land to be given a dressing of 5 tons per acre each year. Trials carried out to ascertain the second year effect on maize following cotton, and cotton composted at the rate of 5 and 10 tons per acre, gave the following important results:

<i>Treatment: Compost applied to Cotton in 1937-38.</i>		<i>Maize Yield, 1938-39, in Bags per Acre. (Bag = 203 lb.)</i>	
Cotton: no compost	13.2
5 tons compost per acre	18.2
10 tons compost per acre	21.6

The Cotton Research and Industry Board functioned effectively throughout the year. The cotton ginnery at Bindura dealt with the entire crop, both European and Native. The rate at which cotton prices are advancing under war conditions may lead to another boom. Should this take place, no fear need be entertained about the country's ability to cope with it. The seed position is sound, as there is a plentiful supply which has been bred to suit Rhodesian conditions, and arrangements for handling, ginning, and marketing are in working order.

364. SOME HINTS FOR COTTON GROWERS (IN SOUTHERN RHODESIA). By G. S. Cameron. (*Rhod. Agr. J.*, July, 1940, p. 387.) The notes deal with the following: Cotton as a rotation crop; choice of land; preparation of soil; planting; treatment of seed; thinning; cultivating and weeding; fertilizing; harvesting; farm costs per acre; insect pests, etc. Two illustrations are included of the depth regulator, which is strongly recommended in connection with the planting of cotton seed.

365. ANNUAL REPORT OF THE SENIOR PLANT PATHOLOGIST, SOUTHERN RHODESIA, 1939. By J. C. F. Hopkins. (*Rhod. Agr. J.*, July, 1940, p. 411.) In connection with the examination of seed, a pathological analysis of sunnhemp seed was made following the observed prevalence of discoloured and misshapen seeds exhibited at the agricultural shows. This was augmented by an examination of material supplied by the Chief Entomologist. Discoloured seeds were surface sterilized, cut in half and plated on culture media. Within a few days the fungus *Nematospora coryli* had grown from nearly all inocula. This fungus has been reported previously in Rhodesia only from internally rotted cotton bolls. Germination tests of commercial and specially selected sunnhemp seed indicated that infection was very high. From seed sown in pots, the plants which survived varied from 42 to 59 per cent. When seed was treated with mercurial dusts and sown in beds, no significant increase in the number of plants over the controls was obtained. The percentage survival varied between 49 and 59.

366. SUDAN: COTTON INDUSTRY, 1937-38. (*Rpt. on Admin., Finan. and Condns. of Sudan, 1938.*) In the Gezira rainfall was generally favourable for cotton, and the incidence of disease was slight, though pink bollworm was prevalent at the end of the season. Tokar Delta had its worst season for many years owing to poor flood, bad weather conditions and basal infection. Cotton was heavily attacked by leaf curl in the Gash Delta, and damage was also caused by rats. The production of rain-grown cotton in the Upper Nile and Equatorial areas decreased, but this was more than offset by a large increase in the Nuba Mountains. Cotton yields were satisfactory on the eight Government pumping schemes in Northern Province, but the type grown has a low ginning outturn, and search continues for the production of a better strain.

Cotton Ginning.—A new factory was in course of construction at Ghorashi in Gezira area. Gezira ginneries handled a record total, and most other factories were fully employed. Shukoli factory was closed down, as the Kajo Kaji cotton was exported to Uganda for ginning. The total outturn of lint from all ginneries amounted to 1,339,960 kantars. Some 107,234 metric tons of seed were produced in addition to 13,100 metric tons from the southern ginneries. Of this latter total 2,971 metric tons were reserved for sowing, and the remainder for the production of suction gas fuel, or converted into cottonseed oil, or destroyed. The surplus dumps of seed at the Nuba Mountains factories provided a welcome addition to the food of native flocks and herds, with a resulting improvement in general condition and milk output. The oil extracting plant at Kadugli functioned satisfactorily throughout the season, and the total production of oil amounted to 195 metric tons.

367. TANGANYIKA: COTTON PROSPECTS, 1939-40. A report from the Department of Agriculture for June states that in the Central and Southern Highlands Provinces Singida cotton is disappointing in growth and quality. In the Lake Province yields of cotton have been affected by jassid attack, but a record crop should nevertheless be harvested finally. Good progress of the cotton crop is reported from the Eastern Province, but in the Southern Province early planted cotton received a setback from the heavy rains in April, while late planted cotton was affected by the hot dry weather experienced during May. Flood lands cotton planting is now being carried out in the Rufiji. In the Northern and Tanga Provinces cotton is promising in all areas, but in the Moshi district still needs rain.

368. UGANDA: COTTON PROSPECTS, 1940-41. The report of the Department of Agriculture for July states that in the Eastern Province weather conditions generally were very favourable except in parts of Busoga, where dry spells again delayed planting. On the whole the earlier sowings have recovered well after the drought in June, and this recovery has been further helped by the more widespread rains in early August. Later sowings have made excellent growth. Crop prospects at this stage are well up to average, based on acreage, spacing, and condition. The incidence of *Lygus* in Central and Budama Districts is, however, heavier than usual. Rains were plentiful in almost every cotton area in Western Province. Planting proceeded rapidly during July and an increased acreage is anticipated. The crop is healthy and up to average. In Buganda Province dry conditions prevailed until the last week in July in western Mengo, Mubende, and Masaka. The weather was more favourable in eastern Mengo. The acreage planted is most satisfactory in the circumstances. In the dry area growth was retarded and much filling of blanks was necessary. Prospects have improved following more rain in August.

369. SOME RESULTS FROM BUKALASA EXPERIMENT STATION (UGANDA). Part I. By G. W. Nye. (*E. Afr. Agr. J.*, May, 1940, p. 460.) In 1927 a demonstration

holding was established to be run by a Muganda and his wife, the underlying idea being to find what acreage a family could cultivate and what profits were likely to be made. The following rotations were practised:

	<i>Economic Crops.</i>	<i>Food Crops.</i>
First year ..	Groundnuts followed by cotton	Beans followed by cassava (short period).
Second year ..	Green manure (<i>Crotalaria juncea</i>)	Cassava (from first year) followed by green manure.
Third year ..	Maize followed by cotton	Groundnuts followed by sweet potatoes.
Fourth year ..	Early planted cotton interplanted with beans	Sweet potatoes (from third year), cowpeas.

The total area of the holding is 4.5 acres, and it has been found well within the capacity of a man and his wife to carry on all the cultivation except when green manure has to be dug in, when hired labour is necessary. The price of cotton has a large bearing on the net cash return to the cultivator. The average return is fairly satisfactory, but after payment of taxes, etc., the average sum available for the holder is Sh. 70 per year, which is not a great return for a year's work; but it has to be taken into account that his family's food has cost him nothing except his own labour, so that he is still better off than a porter earning Sh. 12 a month, and in addition he is independent.

370. AUSTRALASIA. QUEENSLAND: COTTON INDUSTRY, 1938-39. (*Ann. Rpt. Dpt. Agr. and Stock, Queensland, 1938-39*, recently received.) Variable climatic conditions were experienced in some of the cotton-growing districts, and there was a reduction in the number of growers and acreage, though this decline was considered to be only temporary. Exceptionally good returns were obtained from cotton grown on cultivated land, as distinct from that grown on newly felled scrub areas. The practice of rotating cotton with Rhodes grass at triennial intervals also proved beneficial to both crops. The usual programme of research was carried out at the Biloela Research Station with gratifying results. Pure seed stocks of all the commercial varieties are now available in sufficient quantity for the planting of the types of cotton required by Australian spinners. The most popular cottons are still Lone Star, Miller, and New Boykin, while a variety of fairly recent introduction, Oklahoma Triumph, appears promising. Seventeen varieties were imported last year from the United States, and several of these show indication of being useful additions to the present list of cottons. The chief pests encountered during the season were *Heliothis obsoleta*, pink bollworm, rough bollworm (*Earias huegeli*), jassid, *Anomis flava*, cutworms and wireworms; larvæ of the yellow peach moth (*Dichocrocis punctiferalis*) were responsible for damage to the late cotton crop.

371. AUSTRALIAN COTTON INDUSTRY. By J. H. Jolley. (*Text. Wkly.*, 25, 1940, pp. 287, 291. From *J. Text. Inst.*, May, 1940, A295.) A report of a lecture, giving an account, with some statistics, of the growth of cotton spinning in Australia. The mills consume about 30,000 bales of cotton per annum, but imports of manufactured cotton goods are the equivalent of 300,000 bales.

372. WEST INDIES. BARRADOS: COTTON INDUSTRY, 1939-40. (*W. Ind. Comm. Circ.*, June 27, 1940, p. 161.) The cotton crop had been fully harvested and all refuse burnt. The average yield of seed cotton per acre of plantation cotton, 52.5 acres, was 652 lb., and of peasant cotton, 67.6 acres, 309 lb. It was very satisfactory that no pink bollworm was recorded, and it was hoped that with the stringent cleaning-up precautions and strict observance of the close season this would in future be effectively controlled.

COTTON IN U.S.A.

373. AMERICAN COTTON: PRODUCTION. (*Cott. Tr. J., Int. Edn.*, 1940, p. 26. From *Summ. Curr. Lit.*, xx., 10, 1940, p. 232.) A series of articles on conditions in the American Cotton Belt during the past ten seasons, including the following: A general review, "The Cotton Programme" (H. A. Wallace), "Conditions in Texas" (J. E. McDonald), "The Balance between Farms and Factories in North Carolina" (W. K. Scott and J. T. Anderson), "The Growth of other Farming Industries in Georgia and South Carolina" (C. Roberts and J. R. Jones), "The Economic Problems of the Southern States" (V. G. Martin and J. N. Lipscomb), "The Need for Improvement in Ginning Factories and Equipment," "The Development of More and Better Cotton on Smaller Acreage," and "The Encouragement of 'One Variety' Communities" (G. J. Wilds).

374. THE AMERICAN COTTON GROWING INDUSTRY: SOME IMPRESSIONS—I. By H. R. Hosking. (*E. Afr. Agr. J.*, vi., 1, 1940, p. 23.) Deals with cotton cultivation in the San Joaquin Valley of California, which the writer visited in 1938. In that year an area of 380,000 acres produced over 410,000 bales of lint of 500 lb. each. The staple of this cotton, which is all of the Acala variety, varies from $1\frac{1}{8}$ to $1\frac{3}{8}$ inches; over 85 per cent. of the crop falls between $1\frac{1}{8}$ and $1\frac{3}{8}$ inches. Ginning outturn is between 37 and 38 per cent. The average yield of the whole valley over a period of years is approximately 500 lb. of lint per acre, which is equivalent to a yield of 1,447 lb. of seed cotton per acre. Approximate expenditure and receipts resulting from an average acre of cotton in the valley (550 lb. lint and 897 lb. seed) are as follows:

<i>Expenses.</i>				\$
Cultivation and weeding	..	..	..	14.00
Irrigation water	..	..	..	12.00
Picking	..	..	..	14.40
Ginning and baling charges	..	..	..	5.86
Interest on capital and depreciation	..	..	..	?
				<hr/> \$46.26
<i>Receipts.</i>				\$
Value of seed at \$22.00 per short ton	..	..	..	9.87
Value of lint at 10 cents per lb.	..	..	..	55.00
				<hr/> \$64.87
Plus A.A.A. subsidy of 2 cents per lb. lint	..	..	..	11.00
				<hr/> \$75.87

It can be presumed that the A.A.A. subsidy, which amounts to \$11.00 per acre, would never more than counterbalance the interest on capital and depreciation. If this be so, then the maximum profit is in the neighbourhood of \$18.00 per acre. Many farmers will average yields below the mean of the valley, and these will find it quite impossible to grow cotton without the subsidy. California is a one-variety State, but a number of varieties other than Acala are being tested, the chief aim being to obtain resistance to *Verticillium* wilt and tolerance to *Lygus*. Progress has already been made in respect of wilt resistance.

375. AMERICAN COTTON MILL: MODERNIZATION. By J. A. McPherson. (*Text. World*, 90, 5, 1940, p. 72. From *J. Text. Inst.*, xxxi., 8, August, 1940, A429.) The author makes a number of forecasts about developments in mill construction, equipment and management that seem possible in the next decade. On the

question whether the cotton industry in the United States is on the decline he provides charts to show the numbers of spindles in place, active spindles and new spindles, average number of spindle hours per active spindle, production of cloth, population, and cloth consumed per head, for the years 1926-39. A decline of about 10 million spindles has been offset by increasing the operating hours (double and triple shifts) and by improved methods and equipment.

376. AMERICAN COTTON MILL: REORGANIZATION. American Spinning Co. (*Text. World*, 90, 3, 1940, p. 60. From *J. Text. Inst.*, May, 1940, A272.) Some particulars are given, with floor plans showing the location of machines, of the reorganization of the Florence Mills, Greenville, South Carolina. The work is planned in three steps, the first two of which have been completed. Already production has been increased by 10 per cent. without increasing the units of productive machinery. The mill is a self-contained plant for spinning and weaving (1,388 40-inch looms), and the keynote of the layout is "streamline" flow. Thus, in the cloth room a conveyor belt carries rolls of cloth away from the folding machines.

377. AMERICAN COTTON SPINNING AND MANUFACTURING INDUSTRY: OUTPUT 1939. Assn. of Cotton Text. Merchants. (*Text. World*, 90, 3, 1940, p. 44. From *J. Text. Inst.*, May, 1940, A295.) Statistics of equipment, operation and market are tabulated for the years 1930-39. "Spindles in place" at the beginning of 1939 were 25,986,620, a drop of 717,856 on the year and 8,554,866 from the figure for 1930. (The figure for 1940 is 24,943,302.) The drop in number of spindles is offset by the hours run, the hours per average active spindle in 1939 being 4,149, the highest on record. Cotton consumed amounted to 7,367,000 bales. Cloth production was 9,145,765,000 sq. yds. (about 300,000,000 less than the peak year 1937), exports 367,466,000 sq. yds. and imports 111,817,000 sq. yds. Cloth "available for home consumption" was 67.76 sq. yds. per head of the population.

378. AMERICAN COTTON PRICES, 1930-39. By J. R. Wallace. (*Cott. Tr. J.*, *Int. Edn.*, 1940, p. 18. From *Summ. Curr. Lit.*, xx., 10, 1940, p. 232.) (1) A chart is given showing the fluctuations in cotton prices and also in the all-commodity price index during the period 1930-39, and the cotton market conditions in each year are discussed. (2) Actual farm prices and parity prices are tabulated and a diagram shows how far short of the buying needs of the farmer were cotton prices in the past ten years. (3) Prices on the Liverpool market are tabulated for American Middling Fair, Indian No. 1 Fine Oomras, Egyptian F.G.F. Uppers, and Brazilian Fair Sao Paulo. (4) The extent of Government financial assistance to farmers during the past seven seasons is shown in tables and diagrams.

379. THE SHRINKING FOREIGN MARKET FOR UNITED STATES COTTON. By B. S. White, Jr. (*Quar. J. Econ.*, February, 1940. From *Cott. Lit.*, April, 1940, p. 199.) The writer traces and analyses the principal developments in the international cotton situation during the five or six years preceding the outbreak of the present European war.

380. GRADE, STAPLE LENGTH, AND TENDERABILITY OF COTTON IN THE UNITED STATES, 1938-39. (*U.S. Dpt. Agr.*, Washington, D.C., 1940.) This information is given in connection with the annual cotton crop and carry-over. For the first time figures are included on the preparation of ginnings, and also of the staple length of Upland cotton in 32nds of an inch.

381. PIMA AND SXP COTTONS: REVISED GRADE STANDARDS. (*Cotton*, M/c, 45, 1940, p. 7. From *Summ. Curr. Lit.*, xx., 9, 1940, p. 219.) The U.S. Agricultural Marketing Service recently announced revised grade standards for American-

Egyptian Pima cotton and new grade standards for American-Egyptian SXP cotton. These will become effective on March 20, 1941, and in the meantime both may be used permissively (by express contract provisions) in the purchase and sale of cotton of these varieties. The standards consist in each case of five full grades and four half grades. Cotton representing each full grade and each half grade is available in a standard box. The boxes are smaller than those representing the old standards.

382. THE REGIONAL RESEARCH LABORATORIES AND SOME OF THEIR RESEARCH PROJECTS. By H. G. Knight. (*U.S. Dpt. Agr., Bur. Agr. Chem. and Eng.*, 1939. From *Cott. Lit.*, April, 1940, p. 235.) An address given before the Farm Equipment Institute, Chicago, in which the following projects for cotton are mentioned: characteristics of cotton fibre which make it adaptable to use in textiles; studies on changing cotton textile properties which would make them more desirable, such as, for example, new resin finishes; processing the fibres into low-cost textiles for industrial use; studies of linters for use in upholstery and for chemical cellulose; studies of cotton-seed oil.

383. UNITED STATES GOVERNMENT CELLULOSE RESEARCH LABORATORIES: ORGANIZATION. (*Rayon Text. Mnthly.*, **21**, 1940. From *Summ. Curr. Lit.*, **xx.**, **14**, 1940, p. 370.) Congress has set aside \$100,000 for research into the wider utilization of farm products. Four laboratories are to be established, the Southern one in New Orleans. Suggestions for research on cotton linters and the chemistry of cellulose are enumerated.

384. AMERICAN TEXTILE COLLEGES: CURRICULA AND ENROLMENTS. By R. W. Philip. (*Cotton*, U.S. 104, **5**, 1940, p. 58. From *Summ. Curr. Lit.*, **xx.**, **13**, 1940, p. 344.) Particulars are given of the numbers of students enrolled for various branches of textile study and the percentage of time devoted to textile and non-textile subjects at the principal U.S. Technical Colleges in 1939-40. The total number of students taking the day "Collegiate" course was 1,729 (Clemson College heading the list with 344) and evening students numbered 4,045 (Lowell, 1,635). The percentage of time devoted to non-textile subjects ranged from 10 at Philadelphia to 69 at Texas; at the large colleges it was about 50. (The times are "weighted" by a system of "credits" that places more value on an hour at a lecture than an hour in the laboratory.) Various opinions on textile education are expressed on the basis of the data. The conclusion is drawn that the colleges are not training more men than the American textile industry can absorb.

385. LOW-GRADE AMERICAN COTTON: CARDING; DUST HAZARD. By M. F. Trice. (*Text. World*, **90**, 1940, p. 68. From *Summ. Curr. Lit.*, **xx.**, **8**, 1940, p. 178.) Two cases of respiratory disorders among cardroom workers in a North Carolina mill are reported. The trouble appears to have been a new experience for the mill, and is ascribed to the carding of a low-grade coloured cotton and the practice of blowing dust off the cards by means of compressed air. It is recommended that the air in the cardroom should be changed at least six times per hour and that vacuum cleaners should be used.

386. AGRICULTURAL STATISTICS, 1939. (*U.S. Dpt. Agr.* Obtainable Supt. Documents, Washington, D.C. Price 60 cents.) This is the fourth issue of this publication prepared under the direction of the Yearbook Statistical Committee. It includes statistics of grains, cotton, sugar, tobacco, fruits, vegetables; miscellaneous crops; beef cattle, hogs, sheep, horses, mules; dairy and poultry statistics; statistics of foreign trade in agricultural products; farm business and related statistics; miscellaneous agricultural statistics—forestry, weather, roads, etc. A useful index is included.

387. THE GEOGRAPHIC BASIS OF AMERICAN ECONOMIC LIFE. By H. H. McCarty. (Harper and Bros., New York, 1940. From *Cott. Lit.*, x., 7, July, 1940, p. 384.) Cotton is dealt with as follows: Chap. XIV, The Cotton Belt, the Cotton Economy; Chap. XV, Agricultural Sections of the Cotton Belt; Chap. XVI, Cotton Belt Cities. References are given at the end of each chapter.

388. ONE-VARIETY COTTON IMPROVEMENT ASSOCIATIONS. By R. A. Wasson. (*Extension Circ.* 182, La., 1939.) A brief description of the formation of one-variety cotton associations in the United States, giving the terms of the Ginner Agreement and the By-Laws.

389. VARIATIONS IN THE COMPOSITION AND GRADE OF COTTON SEED PRODUCED IN THE STATES OF ALABAMA, GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA, CROP YEARS OF 1934-35 TO 1937-38. By G. S. Meloy. (*U.S. Dept. Agr., Agr. Mkt. Serv.*, 1939. From *Exp. Sta. Rec.*, 82, 3, 1940, p. 328.) During the period covered the oil content of cotton seed produced in the four States ranged from 12.8 to 24.1 per cent., the average range being from about 14 to 21.8 per cent., or an average difference of 155 lb. of oil per ton of seed. The protein content varied, in terms of ammonia, from 2.65 to 4.61 per cent., and the average variation was from 2.92 to 4.37 per cent. ammonia, indicating a range of yields of cake of 41.13 per cent. protein content of from 686 to 1,027 lb. per ton of seed. Report is made also on variations in deterioration and adulteration, below grade and premium grades, and the basis of price in graded and ungraded markets. Public notices establishing grades, standards for grades, and methods of sampling, analysing, and grading cotton seed sold or offered for sale for crushing purposes within the United States are appended.

390. ALABAMA: THE EFFECT OF "DIGGING" AND "HOGGING" PEANUTS ON COTTON YIELDS. By J. P. Wilson. (*Alabama Sta. Leaflet*, 18, 1939. From *Exp. Sta. Rec.*, 82, 4, 1940, p. 478.) "In experiments at the Wiregrass Station cotton did not make satisfactory yields even when receiving 600 lb. per acre of 6-8-4 or 6-8-8 fertilizer after seven successive years of harvested peanuts or with 600 lb. of 6-8-4 in a three-year rotation of corn, cotton, and harvested peanuts. However, cotton gave satisfactory yields in a similar rotation with 6-8-12 fertilizer, and also when supplied with 6-8-4 fertilizer and grown in alternation with hogged-off peanuts, and in 1939 given 600 lb. of 0-8-4 fertilizer. So far as soil fertility is concerned, peanuts should be harvested seldom and hogged off as often as possible."

391. ARIZONA: WEATHER IN RELATION TO YIELD OF AMERICAN-EGYPTIAN COTTON. By H. J. Fulton. (*J. Amer. Soc. Agr.*, 31, 8, 1939, p. 737. From *Exp. Sta. Rec.*, 82, 2, 1940, p. 178.) Data presented show that early-killing frost in the fall and high evaporation during the flowering period are two weather factors which appear to limit yields of American-Egyptian cotton in Arizona. Increased irrigation during the critical flowering period, within reasonable limits, is suggested as a means of counteracting effects associated with high evaporation.

392. ARKANSAS: AGRONOMIC RESEARCH IN 1938-39. (51st Ann. Rpt. Agr. Exp. Sta., Arkansas, 1938-39.) The work on cotton included fertilizer experiments, varietal trials, breeding experiments, fibre investigations and nutrition tests. In a commercial variety test Stoneville 2B proved the best strain both on upland and on delta land. In an advanced strain test Arkansas Acala and Arkansas Rowden were the most successful cottons on both upland and delta land. In connection with the cotton breeding work some 10,000 plants from the inbred lines and crosses were selfed and harvested separately. Staple lengths were determined by combing five to ten seeds from each plant on a machine comber in the cotton fibre laboratory. In general, staple lengths were a little longer and lint

percentages were a little lower than in 1937. The third-year inbreds remained essentially constant from the preceding year, and there was very little evidence of further segregation. Forty-seven of the third-year inbreds were to be grown in isolated blocks in 1939, and were to be subjected to rigorous tests for susceptibility to *Fusarium vasinfectum* before final selections were made. The use of the mechanical comber and the photoelectric sorter made it possible to handle considerably more material in the cotton fibre investigations. In connection with the study of cotton diseases it was found that seed treated with 2 per cent. cerasan dust was less susceptible to wilt disease. By the use of a sand culture technique the effect of various amounts of nitrogen, phosphorus, and potassium on the relative virulence of three cultures of *F. vasinfectum* was observed. The results indicated that an increase in the nitrogen and phosphorus level was accompanied by an increase in wilt severity, whereas an increase in the potassium level was accompanied by a decrease in wilt severity.

393. THE ELECTRIC EYE SORTS COTTON. By K. B. Roy. (*South. Agr.*, March, 1940. From *Cott. Lit.*, April, 1940, p. 219.) An instrument for sorting cotton fibre developed at the laboratories of the University of Arkansas College of Agriculture is commented upon, and also a mechanical combing machine.

394. GEORGIA: COTTON EXPERIMENTS, 1938-39. (51st Ann. Rpt. Exp. Sta., Ga., 1938-39.) In cotton varietal trials in North Georgia the most profitable cottons were Stoneville 2B and D. and P.L. 11A. Coker 100 is an early variety that yields only slightly less than Stoneville, but is more susceptible to wilt. In South Georgia, on the basis of two years' tests on wilt-infested soils, the wilt-resistant varieties Coker 4 in 1, Coker Clewilt 7, and W. W. Wannamaker Wilt Resistant Cleveland 3 are recommended for cultivation. A survey of seventy-eight cotton fields showed widespread distribution of the anthracnose fungus (*Glomerella gossypii*) on cotton seedlings. Treatment of seed with cerasan was most effective in controlling the disease. Studies on cotton wilt disease were continued, and the conclusion was reached that the use of wilt-resistant varieties of cotton is the surest and most practical method of reducing wilt losses.

395. AGRICULTURAL EXPERIMENT STATION, GEORGIA. (51st Ann. Rpt., 1938-39. From *Cott. Lit.*, April, 1940, p. 233.) Work in connection with cotton included: Cotton wilt-potash studies; breeding and selection for wilt resistance; the effect of location on seed-borne organisms in cotton seed; cotton seedling disease survey; cotton-seed treatment; varietal tests, etc.

396. RESULTS OF COTTON VARIETY TESTS, 1936-39. By U. R. Gore. (*Bull.* 204, Ga. Exp. Sta., 1940.) The leading varieties in money value per acre in North Georgia are Stoneville 2B, Coker 100, and D. and P.L. 11A; and in South Georgia, Coker Clewilt 7, Coker 4 in 1, Wannamaker Wilt Resistant Cleveland, and Stoneville 2B. Stoneville 2B has proved the best cotton in all variety tests except where wilt was unusually severe. At the present time about one-half of the one-variety communities in Georgia are using this cotton. Coker 4 in 1, Coker Clewilt 7, and Wannamaker Wilt Resistant Cleveland are the best wilt-resistant varieties for South Georgia. All three have a staple of 1 inch to $1\frac{1}{8}$ inches.

397. LOUISIANA: A DESCRIPTION OF COTTON VARIETIES RECOMMENDED. By H. B. Brown *et al.* (*Extension Circ.* 200, La., 1940.) The varieties mentioned are Station Miller, Dixie Triumph, Deltapine, Stoneville 5, Stoneville 2-B, Delfos 531, Delfos 130, Delfos 425, and Wilds.

398. SOUTHERN REGIONAL RESEARCH LABORATORY, NEW ORLEANS: COTTON RESEARCH PLAN. (*Cotton*, U.S., 1940, No. 3, p. 44. From *Summ. Curr. Lit.*, xx., 9, 1940, p. 231.) The Southern Regional Research Laboratory, now under

construction in New Orleans by the U.S. Dept. of Agriculture, will be devoted to the study of cotton, sweet potatoes and peanuts. It will cost approximately \$1,000,000 and will have an annual operating budget of approximately the same amount. Research on the chemical and physical structures of cotton fibre, and on those inherent properties that govern the utility of cotton, will be conducted in a cotton chemical finishing division. Research in which primary emphasis will be placed on finding new and extended industrial uses for cotton, as well as on clothing and household fabrics, will be conducted in a cotton processing division which will be provided with full textile manufacturing equipment.

399. LOUISIANA: FACTORS IN THE ORGANIZATION AND OPERATION OF FARMS IN AN UPLAND COTTON AREA. By R. J. Saville and S. B. Thornton. (*Bull. No. 309, La.*, 1939.) The purposes of this study were: (1) To evaluate the different systems of farming and their adaptation to farms of different sizes; (2) to measure the relationship between size of farm and operator's income and products for family consumption; (3) to determine the composition of receipts and expenses under different farm organizations; (4) to determine the physical requirements and accomplishments for different systems of farming and sizes of farms; and (5) to arrive at the influence which certain physical factors such as soil and rainfall have upon farm organization and rates of production.

400. MISSISSIPPI: FARM CROPS STUDIES. (*Miss. Farm. Res.*, 2, 10-11, 1939. From *Exp. Sta. Rec.*, 82, 3, 1940, p. 325.) Work on cotton included a study of "Cotton characteristics: money value, staple length, gin turn-out" (J. W. Neely and H. C. McNamara); varietal and fertilizer tests with cotton; studies of the effect of legumes on soil improvement and yields of cotton and corn.

401. NORTH CAROLINA: COTTON MARKETING IN THE COASTAL PLAIN AREA. By J. W. Wright and G. R. Smith. (*N. Car. Sta. Bull.* 325, 1939. From *Exp. Sta. Rec.*, 82, 4, 1940, p. 549.) Includes the findings in the study to determine the marketing practices of farmers, the structure of the local markets, the buying and selling practices of local buyers, the ultimate destination of cotton produced, and the attitude of the farmers toward the present marketing system.

402. OKLAHOMA: COTTON VARIETY TESTS, 1939. By H. E. Dunlavy *et al.* (*Exp. Sta. Circ.*, No. 87, *Agr. Exp. Sta., Stillwater, Oklahoma*, 1940.) Gives the results of nine cotton variety and strain tests conducted in Oklahoma in 1939. While it is impossible to draw definite conclusions on one year's data regarding the most desirable varieties for the different sections of the State, the data collected in the tests indicate that, in the eastern and central portions of the Oklahoma Cotton Belt, Deltapine and Stoneville varieties are the best for yield and staple, Rowden strains show promise, while Half-and-Half yields well but the staple is somewhat short for the market demand. In the south-western parts of the State Mebane cottons are the most successful in yield and staple, while Acala types are also promising.

403. TEXAS COTTONS: FIBRE TESTS. By M. A. Grimes. (*Texas Sta. Rpt.*, 1938, p. 100. From *Summ. Curr. Lit.*, xx., 14, 1940, p. 354.) A summary of data on the percentage of mature fibre, weight per inch, and breaking load of the fibre of Lightning Express and Half-and-Half cottons, the back-cross and the F₁ and F₂ generations.

COTTON IN EGYPT.

404. EGYPT: TAX ON RAW COTTON EXPORTS REIMPOSED. (*Cott. Tr. J.*, 6/4/40. New Orleans. From *Cott. Lit.*, Washington, D.C., x., 5, 1940, p. 294.) The tax of 200 milliemmes per 100 kilos on raw cotton exported from Egypt has been reimposed by Royal Decree effective on August 15, according to advices received

from the American Legation in Cairo. The tax was withdrawn early this season as a means of partly offsetting the effect of the American cotton export subsidy.

405. EGYPTIAN COTTON CROP. (*Text. Wkly.*, 9/8/40, p. 187.) The British Government have confirmed the Egyptian Prime Minister's announcement earlier this week that they would be prepared to buy up all the 1940 cotton crop of Egypt to help our ally. The prices agreed upon are \$14.25 per kantar (about 14.25 cents per lb.) for Uppers, F.G.F. grades, and \$15.25 per kantar (say about 15.25 cents per lb.) for F.G.F. Giza grades.

COTTON IN OTHER FOREIGN COUNTRIES.

406. AFGHANISTAN TO GROW COTTON. (*Finan. News*, 2/3/40. Bombay. From *Cott. Lit.*, Washington, D.C. x., 6, 1940, p. 337.) With a view to the encouragement of cotton cultivation in Afghanistan, the Afghan Government have decided to abolish all taxes on cotton for a period of one year. Orders to this effect have been issued by the Ministry of Economic Affairs.

407. ARGENTINE COTTON INDUSTRY: EXPANSION. By W. G. Ashmore. (*Text. World*, 90, 1, 1940, p. 60. From *J. Text. Inst.*, May, 1940, A295.) The cotton industry of Argentina is located in about twenty mills (1935 census) with 350,000 spindles. Wages are high (1.50 to 2.50 dollars per day in Buenos Aires) and operative efficiency high. A worker who has been employed three months is considered "permanent," and enjoys certain legal safeguards against dismissal. The most important mill is the S.A. Fabrica Argentina de Alphargatus, Buenos Aires, employing 7,500 persons (6,800 women), and running 50,000 spindles on high-draft, large package spinning. Cotton cultivation is carried on over about one million acres; the crop in 1936 was about 350,000 bales.

408. BOLETIN MENSUAL. (*Min. de Agr., Buenos Aires.*) *Bull. No. 59* contains the following among other papers in Spanish: "The Employment of Artificial Light for Cotton Classification"; "The Use of Aeroplanes in the Campaign against Cotton Pests" (H. M. Pinochet); "The Multiple Uses of Cotton and its Derivatives" (A. L. Ward). *Bulls. Nos. 60, 61 and 62* contain brief articles dealing with various aspects of the cotton industry in Argentina, together with a short paper on control measures against the *Gorgojo paraguay*, which attacks cotton in the Chaco territory (p. 164). Statistics are included of acreage, production, prices, and exports.

409. COTTON BALE COVERINGS (ARGENTINA): APPLICATION AND ADVANTAGES. By U. A. Vergés. (*Bol. Mens.*, 57, p. 7, Argentina, 1940. From *Summ. Curr. Lit.*, xx., 13, 1940, p. 315.) The use of cotton fabric for covering bales of cotton is discussed, and details are given of the types of cotton fabric used for this purpose in the United States and Brazil. It is pointed out that the advantages of cotton coverings compared with the usual jute covers include better appearance of the bale, reduction in the loss of fibre, elimination of trouble in spinning due to the presence of jute fibres, reduction in transport costs, better durability of the covering and greater possibility of re-use, and also the provision of a new outlet for cotton, especially for low qualities. Tests of the suitability of two types of cotton fabric for use as bale coverings are reported. The above advantages were confirmed in the case of the more suitable of the two fabrics which had a weight of 198 g. per sq. metre. This is cheaper and lighter in weight than the cotton bale covering used in the United States, but has a closer texture and provides better protection for the bale. Costs of cotton and jute bale coverings are compared, and it is pointed out that the cost of the former is not

appreciably greater when the possibilities of re-use are considered. It is estimated that about 341 tons of low quality cotton could be used in the Argentine annually for bale coverings.

410. BULGARIA: GOVERNMENT AID TO INCREASE COTTON PRODUCTION. (*U.S. Dpt. Agr. Off. For. Agr. Relatns., For. Crops and Markets*, **40**, June 8, 1940. From *Cott. Lit.*, x., **7**, July, 1940, p. 418.) An increase of 25 per cent. in prices paid to Bulgarian cotton producers by the Grain Monopoly was authorized by the Bulgarian Council of Ministers on April 25, 1940, according to a report from the American Vice-Consul at Sofia. This measure was designed to encourage an increase of 50 per cent. in Bulgaria's domestic cotton production at a time when import supplies are difficult to obtain. Under normal conditions approximately 45,000 bales of raw cotton are imported annually, largely through German merchants. Bulgarian production has increased steadily from about 4,000 bales of 478 lb. in 1931-32 to 32,000 bales in 1938-39, and an estimated 74,000 in 1939-40.

411. NORTH AND SOUTH AMERICAN COTTON PRODUCTION. By W. R. O'Shields. (Pubd. by Clemson Textile Sch., Clemson, S. Car. From *Cott. Lit.*, x., **7**, July, 1940, p. 391.) Production and the textile industries of the United States and Brazil are discussed and compared. A table is included showing consumption and spinning spindles in Brazil for the seasons 1930-31 to 1938-39.

412. BRAZILIAN COTTON: PRODUCTION. By C. A. Meyer. (*Cott. Tr. J., Int. Edn.*, 1940, p. 39. From *Summ. Curr. Lit.*, xx., **10**, 1940, p. 232.) The production of cotton in Ceará is tabulated for the seasons 1928-29 to 1938-39. The estimate for 1939-40 is about 132,000 bales. The grader's classification of the crop in August, 1939, was: Type 3, 21-66 per cent.; Type 4, 43-50 per cent.; Type 5 (roughly corresponding with American middling), 27-49 per cent.; better types (1 and 2), 2-88 per cent.; and poorer types (6 and below), 4-47 per cent. The classification by staple length was: 28-30 mm., 46-66 per cent.; 30-32 mm., 53-33 per cent.

413. COTTON EXPORTS IN 1939. (*Text. Wkly.*, 28/6/40, p. 762.) Cotton exports from Brazil in 1939 totalled 324,000 metric tons (of 2,205 lb. each), valued at 1,159,000 contos, compared with 269,000 tons and 930,000 contos in 1938, an increase of 55,000 tons value, according to official statistics from Brazil quoted by the U.S. Dpt. of Commerce. The exports were a record in both quantity and value. The feature of the year was the sharp increase in shipments to China—from 7,544 tons in 1938 to 48,030 in 1939. Larger figures were likewise recorded for Japan, France, Italy, and the Netherlands, while shipments to the United Kingdom and some other countries showed a decline. Among new markets for Brazilian cotton were Canada, Colombia and Spain.

414. COTTON BANDS FOR BALES. (*Text. Rec.*, March, 1940. Manchester. From *Cott. Lit.*, x., **6**, 1940, p. 329.) In view of the difficulty of obtaining steel bands for the baling of cotton, experiments have been proceeding for some time with a view to the use of bands made of cotton. These experiments having proved successful, the authorities have consented to this new method being employed, and it is expected that much of the cotton leaving Brazil this year will be secured with cotton bands.

415. ESCOLA DE AGRONOMIA DO NORDESTE. SERVIÇO DE MELHORAMENTO DO ALGODÃO NA PARAIBA. By C. V. de Oliveira Faria. (*Sec. Agr. Com., Viacao Obras Pub.*, Brasil, 1938. From *Pl. Bre. Abs.*, x., **2**, 1940, p. 125.) A general outline is given of the work of seed control and of plant breeding; descriptions are given of the methods of mass and individual plant selection, of field experimentation and calculation of the results, and of the technique of lint studies. The local cotton commonly known as *Erbáceo Paraibano* is very mixed and

inferior in quality; the imported Texas is in a good state of uniformity and quality, but the selection H-105 made by G. C. Bolland at Ceará is still more promising and seems more suited to local conditions than the variety Texas. Individual plant selections have been made in the varieties Texas, Express and H-105 on the basis of length and uniformity of lint and other fibre qualities; full data relating to the various plants selected are presented, showing the superiority of H-105 over the other two, especially under drought and other bad weather conditions. In respect of yield, lint index, mean weight of 100 seeds and number of bolls per kg. the differences were statistically significant. Some of the Texas selections are also promising, having yielded 296 kg. per ha. more than the standard and given a lint percentage of 38.9, with a lint index of 7.7, the lint being exceedingly uniform in length.

416. CHINA: PLANS FOR INCREASED COTTON ACREAGE. (*Text. Wkly.*, 2/8/40, p. 147.) Plans for the expansion of the 1940 Chinese cotton acreage are being pushed both in Chinese controlled territory and in Japanese occupied areas, according to the American Agricultural Attaché at Shanghai. Estimates based on present plans for planting and normal growing conditions during the coming season indicate that the production in China and Manchuria may be increased by 20 to 25 per cent. above last year's estimated harvest of about 1,900,000 bales of 478 lb. net. Total production in territory controlled by the Chinese Government, however, has been relatively small, and thus far producers in areas under Japanese control have been slow to respond to Japanese encouragement.

417. L'INFLUENCE BIENFAISANTE DE LA CULTURE DU COTON POUR L'INDIGÈNE. By F. Claus. (*Bull. Agr. du Congo Belge*, xxx., 4, 1939, p. 744.) A summary of a paper by G. Boussenot in the *Rev. Pol. et Parlementaire*, Paris 1939, dealing with the development of cotton growing in French Equatorial Africa. The benefits of cotton cultivation for the natives are discussed, and replies given to some objections raised.

418. IL COTONE ITALIANO. By E. de Gillis. (*Gior. di Agr. della Domenica*, Apl. 14, 1940. From *Cott. Lit.*, Washington, D.C., x., 5, 1940, p. 241.) Some aspects of the cultural problem in connection with Italian cotton.

419. JAPANESE COTTON MILLS: ATMOSPHERIC CONDITIONS. By S. Katuki and H. Sukegawa. (*Rpt. Japan Inst. Sci. Lab.*, 42, 1939, p. 1. From *Summ. Curr. Lit.*, xx., 7, 1940, p. 166.) Records of temperature and humidity are reported for 22 cotton spinning mills, 25 cotton weaving mills, 20 combined spinning and weaving mills, and 11 factories concerned with woollen, silk, hemp and hosiery manufacture, and with dyeing, in the Osaka district. In cotton spinning rooms the monthly average temperatures ranged from 73° F. in January to 95° F. in August, and humidities from 42 per cent. in January to 59 per cent. in September. In mixing rooms the ranges were 55 to 88° F. and 51 to 71 per cent. R.H. In cotton weaving sheds temperatures ranged from 72 to 90° F., but humidity was fairly constant at slightly more than 80 per cent. R.H. If the American "effective temperature" of 75° F. is accepted as a maximum for the well-being of operatives, Japanese cotton mills are above this for half the year. The woollen and hemp factories were slightly better. In an investigation of the thermal comfort of female cotton operatives, at least 80 per cent. were said to be "comfortable" at all dry-bulb temperatures from 56 to 74° F., but the authors compute that the best temperature is 68 to 70° F. In terms of "effective temperature" they recommend 63 to 65° F., though most of the women were "comfortable" at all effective temperatures between 54 and 70° F.

420. EXPERIMENT STATIONS. (*Cott. Tr. J.*, 11/5/40. New Orleans. From *Cott. Lit.*, x., 6, 1940, p. 319.) Japan is planning to establish ten cotton experi-

ment stations in the occupied areas of China, with a view to developing varieties suited to the region, according to reports received by the U.S. Dept. of Commerce. Pink bollworm damage in China has been very severe this season.

421. MOROCCO: COTTON CULTIVATION. By E. Miegé. (*Fils et Tissus*, 27, 1938, p. 211. From *Summ. Curr. Lit.*, xix., 12, 1939, p. 346.) Investigations of the possibilities of cotton cultivation in Morocco were started in 1914, and trials were made with various American and Egyptian cottons. The best results have been obtained with an improved strain of Sar-Sar, an indigenous cotton, and with Pima 67, a selection isolated in 1927, which gives a high yield of good quality. Large-scale tests were carried out from 1921 onwards, but after 1927 a decline followed owing to unfavourable economic conditions. The results of technological studies of Pima 67 in 1933-36 are discussed. Costs of production vary considerably, and although a Government subsidy is available and large areas are suitable for cotton cultivation the areas used for this purpose are not yet very extensive.

422. NORTH AFRICAN TEXTILES: HISTORY. By J. Gallotti. (*Ciba Rev.*, 21, 1939, p. 738. From *J. Text. Inst.*, xxx., 8, 1939, A516.) An illustrated account is given of methods of weaving and dyeing in Morocco, Algeria and Tunisia from an historical viewpoint. In Morocco the chief products are tent strips, mats, carpets, woollen textiles made on vertical looms, and woollen and silk fabrics woven on technically more perfect looms. Weaving in Algeria is done on the vertical loom. Mats, linen, woollen and cotton fabrics, smooth and pile rugs and silks are manufactured in Tunisia.

423. PERU: MEMORIA DE LA ESTACION EXPERIMENTAL AGRICOLA DE LA MOLINA. 1938. We have received a copy of this publication containing the reports of the Departments of Agronomy, Entomology, Phytopathology, Genetics, and Agricultural Technology. In connection with cotton, manual experiments, chiefly with guano in various proportions, were continued, and breeding work with different varieties was also carried out. The entomologist reports the following pests as causing injury to cotton during the year: *Mescinia peruella*, *Dysdercus*, *Hemichionaspis minor*, *Anthonomus vestitus*, *Anomis texana*, *Gasterocercodes gossypii*, *Thrips*, and *Aphis*.

424. PORTUGAL: COMISSÃO REGULADORA DO COMÉRCIO DE ALGODÃO EM RAMA. (*Bol. dos organismos Corporativos e de Co-ordenação Econ. de Comércio e da Indústria*, 2, 3, Lisbon, June, 1939. From *Cott. Lit.*, March, 1940, p. 167.) "A report, covering the period May, 1938, to May, 1939, on the work of the Regulatory Commission of Trade in Raw Cotton. Two orders were issued, the first of which created a Junta of Colonial Cotton Exportation (Junta de Exportação do Algodão Colonial) with a seat at Lisbon, and representatives at Mozambique and Angola, whose duties are to encourage production and improve the quality of cotton, regulate the trade of the colonies, control this trade, issue certificates of quantity and quality, and gather in the chief city cotton which has not been freely negotiated. The second order relates to the regulation of the colonial cotton trade and the establishment of rules defining the new régime of cotton protection and development. Other measures include the establishment of standards for Portuguese colonial cotton; efforts to regulate imports of foreign cotton according to colonial production and its consumption by the State so as to secure the normal activity of the factories; bounties and obligatory distributions; and technical services."

425. COTTON GROWING IN RUSSIA. (*Text. Wkly.*, 26/7/40, p. 103.) Russia is stated to be the third largest cotton producer in the world. In at least one year since 1935 production reached 3,500,000 bales. Mills in the Soviet Union are now using home-grown cotton, and little is imported. Cotton is generally

grown under irrigation, and seed of American origin is used. Most of the staple is 15/32nds up to 31/32nds inches in length. The industry is supervised by the Government. The farmer sells his cotton in the seed to the Government; it is ginned on a Government-owned gin, and processed into yarn in a Government-owned mill. In the more northerly areas yields are light and the cotton is of poorer quality, so it would appear that there is little chance of expanding acreage in these areas. The further expansion of the industry would necessitate additional costly irrigation developments.

426. COTTON IN AZERBAIJAN. (*Cotton*, M/c, 25/5/40. From *Cott. Lit.*, x., 7, 1940, p. 396.) The cotton fields of Azerbaijan in 1939 yielded a crop of 220,000 tons of cotton, 30,000 tons more than in 1938. The area under cotton in 1939 was 83 per cent. greater than the area under cotton in 1913.

427. THAILAND: COTTON INDUSTRY. (*Text. Col.*, December, 1939. New York. From *Cott. Lit.*, x., 6, 1940, p. 341.) During each of the last three years production of lint cotton in Thailand has approximated 3,500,000 lb. More than a million pounds of seed cotton were exported from the country in the fiscal year 1938, Japan absorbing the major portion of the shipments. In the same period exports of lint cotton totalled 750,000 lb., more than 80 per cent. of which went to Germany.

428. LA QUESTION COTONNIÈRE EN TURQUIE. By S. N. Turgay. (*Coton et Cult. Cotonn.*, xiii., 2, 1939, p. 51.) The main points in connection with the cotton industry in Turkey are briefly summarized.

429. URUGUAY: NEW COTTON SPINNING MILL. (*Text. Wkly.*, 14/6/40, p. 693.) A concern, with an authorized capital of 3,000,000 pesos, has been organized for the joint purpose of spinning cotton yarn and cotton growing, according to the *Gaceta Commercial* of Montevideo. The idea appears to be to make Uruguay ultimately independent of foreign cotton yarns, which at present are imported principally from Great Britain and the United States.

SOILS, SOIL EROSION AND MANURES.

430. AN INTRODUCTION TO SOIL SCIENCE. By B. Işgur. (Agr. Sci. Pub. Co., Boston, Mass., 1938. From *Exp. Sta. Rec.*, 81, 4, 1939, p. 476.) "There are so many details included in most textbooks that the average student fails to gather the fundamentals. With this fact in mind, the author has attempted to set forth the fundamentals of soil science, and has left with the instructor the filling in of whatever detail and illustration he may deem necessary." The contents are: A foreword; chapters 1 to 16 being entitled historical, some elements of chemistry, the origin of the earth, the rock-soil cycle, soil formations, soil separates and soil classification, soil texture and soil structure, tillage and tillage implements, soil surveys, plant nutrition and composition, organic matter and micro-organisms, soil acidity and lime, soil moisture, drainage and drainage systems, crop rotations, and fertilizers respectively; soil diagnosis and soil diagnosis key; exercises; and a general index. The chapter on tillage and tillage implements is by C. H. Thayer, State College, Massachusetts.

431. THE MINOR ELEMENTS OF THE SOIL. By G. V. Jacks and H. Scherbatoff. (*Tech. Commn.*, No. 39. Pubd. by Imp. Bur. Soil Sci., Harpenden, England. 1940. Price 4s. post free.) This is essentially a revision of the authors' previous work, "Soil Deficiencies and Plant Diseases" (*Tech. Commn.*, No. 31), published in 1934, and now out of print. Most of the sections have been completely rewritten, and more attention has been paid to the questions of the occurrence and reactions of minor elements in the soil, and relatively—but not absolutely—less to the physiological aspects of deficiency diseases. Reference is also made to a

few instances of toxicity caused by the presence of minor elements in injurious quantities. Cobalt, selenium, iodine, molybdenum, chromium and thallium have been added to the list of elements discussed in the previous publication. The elements are arranged as follows: (1) Boron, manganese, copper and zinc are apparently essential plant nutrients which are toxic in any but the smallest quantities; (2) iron, magnesium and sulphur are minor "classical" nutrient elements; (3) deficiencies of iodine and cobalt affect animals, but not (so far as is known) plants; (4) selenium and molybdenum are toxic to animals when ingested from herbage; (5) thallium and chromium are abnormal soil constituents which may be the cause of certain disorders of plants. Some 478 references to the literature on the subject are included.

[Cf. Abstr. 283, Vol. XII. of this Review.]

432. EFFECT OF ORGANIC MATTER ON THE WATER-HOLDING CAPACITY AND THE WILTING POINT OF MINERAL SOILS. By G. J. Bouyoucos. (*Soil Sci.*, **47**, 5, 1939, p. 377. From *Exp. Sta. Rec.*, **81**, 4, 1939, p. 480.) The author shows that a high percentage of organic matter markedly increases the available water capacity of light soils and to a lesser degree than that of heavier soils. This relation held good whether the percentages were based on weight or on volume. Various organic materials and several soil types were used. The data given indicate that the wilting percentage was also increased by added organic matter, but rose less rapidly in proportion to percentage of organic matter than did the water retention.

433. CULTIVATION OF COTTON ON COMPLEX SOLONETZ SOILS. By M. G. Taranovskaia and M. M. Gorienskii. (*Sovet. Khlop*, **1**, 1938, p. 30. From *Cott. Lit.*, April, 1940, p. 185.) (In Russian.) "The most effective method of cultivation of solonetz soils consists in complex application of farm manure and gypsum, with progressive deepening of the arable layer (1 to 1.5 cm. per year). Application of gypsum increases the quantity of water-resistant aggregate in the soil; the filtering power of the latter increases, as do the total porosity and (within certain limits) the water-absorbing capacity. The quantity of Na adsorbed decreases, which explains why gypsum-treated soils do not form a hard crust. Application of lime has but little influence on the crop yield of cotton."

434. PERENNIAL GRASSES AND SOIL STRUCTURE. By R. Bradfield. (*J. Amer. Soc. Agr.*, 1937, p. 89. From *E. Afr. Agr. J.*, May, 1940, p. 435.) "Grass roots are so numerous that in a well-established sod they are seldom over 3 to 5 mm. apart. Each root represents a centre of water removal. As water is removed, the small fragment of soil between the roots shrinks and is blocked off by the roots. The pressure developed by the capillary forces, compressing the granule from all sides, is great; in many soils it reaches over 5,000 lb. per square inch. As a result these granules become quite dense, their apparent specific gravity ranging from 1.8 to 2.0. The total pore space inside them is small and the size of the pores is very small. Water moves into them slowly, but is held firmly. The pores are so narrow that they are easily completely sealed by capillary water, and as a result the ventilation of the interior is poor. Consequently, reducing conditions frequently exist in the interior of the granules simultaneously with oxidizing conditions on their surface. This often causes a migration of substances which are more soluble when in the reduced form to the surface of the granules, where they are oxidized and deposited. This deposit serves as a cement and helps to stabilize the granule. In forcing its way through the soil many cells are sloughed off the living root and serve as food for bacteria. Eventually the roots die and are decomposed *in situ*, forming a humidified, often water-resistant, coating around the granule. The marked difference in colour between the surface of such granules and their interior is evidence of this. In the strongly granulated

soil practically the entire mass of clay and silt particles are clumped together in these water-stable aggregates. As a result there are two fairly sharply-defined groups of pores in such soils—capillary pores within the granule and non-capillary pores between the granules. The non-capillary pores are relatively large. Such a soil has a permeability approaching that of sandy soils combined with a storage capacity of the heavier-textured soils. These are the structures which perennial grasses tend to develop in soils. Such soils provide optimum growing conditions for most crops. It is not known how many seasons' growth are required to produce the optimum structure. The major part of the work is probably done in the first few years of growth of the sod. The development of the desirable structure involves the use of growing plants."

435. SOME ASPECTS OF MODERN PRACTICE IN SOIL SURVEY. By G. Milne. (*E. Afr. Agr. J.*, v., 6, May, 1940, p. 436.) Stresses the need for the results of soil surveys to be so reported as to convey the maximum information regarding land types.

436. SOIL CONSERVATION. By H. H. Bennett. (McGraw-Hill Pubg. Co., Ltd., 1939. Price 40s. From *Bull. Imp. Inst.*, xxxviii., 2, 1940, p. 208.) In his wide and comprehensive treatment of the subject the author has not only provided a valuable reference work, but an account of such interest that it should be a real contribution in bringing home to the public the urgency of this problem. The fact that much of the subject matter is concerned directly with soil conservation in the United States does not materially reduce its general application. Part I, The Problem—Soil Erosion, forms nearly one-third of the book, and describes the various types of erosion, their extent and the manner in which they occur, and includes an interesting chapter on the influence of soil erosion on civilization, past and present. Part II gives details of the various methods of conservation in use, and contains accounts of actual problems and soil conservation programmes which are being carried out in different areas of the United States. The discussion of such general programmes is made all the more valuable in view of the author's close association with the United States Soil Conservation Service. The numerous excellent illustrations and diagrams included in the text form a further valuable feature.

437. SOIL CONSERVATION: THE RESEARCH SIDE. By G. Milne. (*E. Afr. Agr. J.*, vi., 1, 1940, p. 26.) A summarized account of the investigational side of soil conservation as seen by the author in the parts of the United States visited by him in 1938.

438. SOIL AND WATER CONSERVATION. By D. Aylen. (*Rhod. Agr. J.*, xxxvi., 1940, p. 330.) A continuation of the discussion of the problem as it affects Southern Rhodesia. Part IV is concerned with the prevention and control of gullies, and the various sections of the paper are headed: Damage done by Gullies; Principles of Gully Prevention; Grassed Outlet Drains and Grassed Waterways; Prevention of Erosion at Outlets in Gullies or Drains; Structures for Gully Control; Maintenance of Structures. Several useful illustrations and diagrams are included in the paper.

[Cf. Abstr. 129, Vol. XVII. of this Review.]

439. ROADS AND THEIR RELATIONSHIP TO SOIL CONSERVATION IN KENYA. By C. Maher. (*E. Afr. Agr. J.*, May, 1940, p. 425.) In this paper, which is furnished with several illustrations, the author suggests ways and means by which the road engineer, the administrator, the farmer, or the native may co-operate to obtain both good roads and land unspoilt by uncontrolled run-off. The need is stressed for more care in alignment of roads, the great importance of good drainage, and the correct location and good construction of farm and field roads in order to control erosion on the farm.

440. SOILS AND FERTILIZERS. By G. V. Jacks. (Reprinted from *Rpts. of Proc. of App. Chem.*, xxiv., 1939.) A useful review of the work of the year in connection with soil science given under the following headings: Soil Nitrogen; Phosphates and Phosphate Fixation; Fixation of Potassium in Soils; Mechanical Analysis; Reclamation of Alkali Soils; Soil Toxins; Soil Structure and Microbiology; Organic Fertilizers; Phosphatic Fertilizers; Compound Fertilizers; Blast-Furnace Slags; Sea-water Magnesium Oxide; Fertilizer Placement.

The State subsidy, given for the first time in 1939 for ploughing up and re-seeding inferior grassland, continues the policy expressed in the Land Fertility Act of 1937 of applying State assistance for agriculture as directly as possible to the soil. There was a very marked increase in the demand for soil analyses, particularly with regard to lime requirement, in order that full benefit might be derived from the lime subsidy. An increased interest on the part of the State and of farmers, and a renewal of the attack by research chemists on the difficult problems of the economic and physiological availability of fertilizers added to reclaimed land, could have been confidently anticipated but for the outbreak of war.

441. AN AGRICULTURAL TESTAMENT. By Sir Albert Howard, C.I.E. (Oxford Univ. Press, 1940. Price 15s. net.) This important work, published on June 13, 1940, is the continuation of an earlier book by the same author, "The Waste Products of Agriculture," published in 1931, in which the Indore method for the manufacture of humus from vegetable and animal waste was described. The purpose of the book is threefold: (1) To draw attention to the destruction of the earth's capital—the soil; (2) to indicate some of the consequences; and (3) to suggest methods by which the lost fertility can be restored and maintained. This ambitious project is founded on the author's experience of forty years, during which his attention has been devoted to agricultural research in the West Indies, Great Britain, and India. It takes account of additional information on the rôle of humus in agriculture which has become available during the last eight years. Great stress is laid on the mycorrhizal association as a factor in nutrition, the living fungous bridge between humus in the soil and the sap of plants. The author sees in the mycorrhizal association an explanation of the principles underlying soil, plant, and animal health, the disregard of which in the practice of artificial manuring has led to a slow deterioration in agriculture, with all its consequences of disease and loss of quality. Part I of this book deals with the part played by Soil Fertility in Agriculture, the various sections being concerned with Nature's Methods of Soil Management; The Agriculture of the Nations which have passed away; The Practices of the Orient; The Nature of Soil Fertility; The Restoration of Fertility. Part II deals with the Indore Process: the Raw Materials needed in Manufacture and the Process of Manufacture; Practical Applications of the Process for Tea, Sugar-Cane, Cotton, Sisal, Maize, etc.; Developments of the Process in Connection with Green Manuring, Grassland Management, the Utilization of Town Wastes, etc.

442. COMPOSTS. By Sir E. J. Russell. (*Trop. Agr.*, xvii., 8, 1940, p. 149.) This paper is reprinted from *J. Min. Agr.*, xvii., No. 8, 1940. After dealing briefly with early methods of composting, the author goes on to discuss modern methods and the materials used in composting. In his view there is little doubt that well-made compost has considerable fertilizer value, but actual figures are lacking, and therefore no comparisons with artificial fertilizers or farmyard manure are possible. In connection with the possible survival of plant diseases in composts, the author writes as follows: "It is not possible to state definitely whether plant diseases are, or are likely to be, spread through diseased material that may have got into the compost heap. No direct experiments have been done on the subject. Bewley found that tomato stems and leaves carrying

spores of *Verticillium* disease were dangerous in the compost heap and badly infected the next crop. On the other hand, there is no evidence that the spores of ordinary blight (*Phytophthora infestans*) would survive composting of potato haulm, though wart disease and pink rot might do so. In gardens it is impossible to avoid diseases completely, and while certain of them, such as virus diseases and others, would not be likely to survive the composting process, others caused by organisms producing highly resistant spores might do so. Possibly finger and toe would survive; it is known that its spores remain viable when passed in the dung of cattle and sheep."

443. COMPOSTS AND SOIL FERTILITY. By C. N. Acharya. (*Ind. Farmg.*, i., 1940, pp. 66 and 121.) A general discussion of the subject under the following headings: Difficulties in the Tropics; Methods of Composting; Activated Compost; Moisture and Reaction; Temperature and Fly-Breeding; Efficiency of Conservation of Nutrients, etc.

444. FARM MANURE. By R. M. Salter and C. J. Schollenberger. (*Ohio Sta. Bull.* 605, 1939. From *Exp. Sta. Rec.*, **82**, 3, 1940, p. 307.) This is a detailed discussion of all phases of the subject, accompanied by a bibliography of 118 citations. The contents deal with the manure production process, litter, the rotting of manure, losses from manure, use of chemical preservatives, fresh *v.* rotted manure, practical methods of handling, European storage practice, field management, composition, quantity of manure produced, fertilizing properties, manuring for crop production, manuring the crop rotation, effects of manure on feeding value and quality of crops, effects of manure upon the soil, objectionable features of manure, manure as an economic asset on the farm, and manure in a complete fertility system.

445. CHEMICAL CONSERVATION OF MANURE. By C. J. Schollenberger. (*Ohio Sta. Bimo. Bull.* 195, 1938, p. 219. From *Exp. Sta. Rec.*, **80**, 5, 1939, p. 595.) The author believes, on the basis of economic considerations, that moist, compact storage with precautions against leaching, together with prompt covering with soil after spreading in calm, cool, moist weather, is to be preferred to conservation of nitrogen by the addition of chemicals. If acid peat moss is available for use as stable litter its ability to absorb ammonia and limit fermentation will result in fewer losses than are usual with straw.

446. ORGANIC AND INORGANIC MANURES: THEIR RELATIVE EFFECTIVENESS. By Sir E. J. Russell. (*Scot. J. Agr.*, xxii., p. 319. From *Madras Agr. J.*, February, 1940, p. 83.) The oldest and best-known method of manuring the land is by farmyard manure, but the chief drawback is that there is not enough of it. Liebig suggested that the elements of plant food could be supplied by simple inorganic salts, called artificial fertilizers. Lawes at Rothamsted showed how this could be done in practice. The farmyard manure, besides supplying the standard plant food, keeps up the supply of the organic matter in the soil, improves the physical properties of the soil, and influences the moisture content. Claims made that crops grown with farmyard manure are healthier, more resistant to pests and diseases, and of better nutritive value for men and animals than those grown with artificial fertilizers, have not been substantiated. In making comparisons, it is necessary that the artificial fertilizers should be complete, including not only the standard plant foods, but also such special minor elements as boron, zinc, manganese, iron, etc. Alternative organic substances (guano, poultry manure, bone and fish manures, oilcake manure) supply plant food, and are sometimes more valuable than farmyard manure. Waste vegetable matter can be converted into useful manure by composting. The essential features are that the supply of moisture, of nitrogen and of phosphate should be adequate for the micro-organisms.

447. THE EFFECT OF VARIOUS NITROGENOUS FERTILIZERS ON SOIL FACTORS AFFECTING THE YIELD OF CROPS. By F. L. Davies. (*La. Sta. Bull.* 301, 1938, p. 22. From *Exp. Sta. Rec.*, **80**, 5, 1939, p. 595.) The results of a source-of-nitrogenous-fertilizer experiment and of a general-fertilizer test are reported. The soil reaction and available phosphorus content of plats fertilized for a period of ten years with different sources of nitrogen are given. Sodium nitrate and sodium-potassium nitrate produced more cotton than other sources of nitrogen. Without liming, the average yields for the ten-year period were as follows: Sodium nitrate 100, sodium-potassium nitrate 100, calcium nitrate 97, calcium cyanamide 91, urea 91, ammophos 90, and ammonium sulphate 89. After liming to a soil reaction of pH 6.8, ammophos and ammonium sulphate produced yields of 111 relative to the yield from sodium nitrate as 100. The continued use of acid-forming fertilizers caused an increase in soil activity, with an associated decrease of soil bases, and a reduction of the availability of phosphorus. The reaction of the soil after ten years of continuous fertilization with the same materials was as follows: Ammonium sulphate pH 5.5, no fertilizer check pH 5.6, ammophos pH 5.6, no nitrogen check pH 5.7, one-third ammonium sulphate and two-thirds sodium nitrate mixed pH 5.8, urea pH 5.9, half sodium nitrate and half cottonseed meal mixed pH 6.0, calcium nitrate pH 6.0, calcium cyanamide pH 6.1, sodium potassium nitrate pH 6.2, and sodium nitrate pH 6.4. The largest quantities of available phosphorus resulted from the use of fertilizers containing calcium—namely, calcium nitrate and calcium cyanamide. Liming the ammonium sulphate and ammophos plats, from pH 5.6 to pH 6.8, increased their content of available phosphorus relative to the other plats. A decrease in the availability of phosphorus was associated in general with increased soil acidity. The yield of cotton was more closely related to the available phosphorus than to soil reaction.

448. FERTILIZER MATERIALS AND MIXED FERTILIZERS. By A. W. Blair. (*New Jersey Sta. Bull.* 651, 1938. From *Exp. Sta. Rec.*, **80**, 6, 1939, p. 738.) "On account of the important changes that are taking place in the field of fertilizer manufacture and practice, it has seemed worth while to prepare a publication in which the situation is brought up to date, listing the materials that are now available for use, with a brief account of methods of preparation and use." This bulletin deals with the elements supplied by fertilizers, functions of fertilizer elements, sources of plant food, mixed and high analysis fertilizers, methods of application, fertilizers and crop injury, fertilizers and soil reaction, spray residues and soil reaction, fertilizers for different crops, residual effects of fertilizers, and soil analysis and the use of fertilizers.

449. COMMERCIAL FERTILIZERS: THEIR SOURCES AND USE. By G. H. Collings. (P. Blakiston's Son and Co., Philadelphia, 1938. From *Exp. Sta. Rec.*, **80**, 6, 1939, p. 738.) This is a textbook for agricultural college use. Previous courses in botany, chemistry, geology, soils and agronomy are assumed. The various chapters deal with the following among other matters: The origin and development of the use of commercial fertilizers; manufacture and use of ammonium sulphate, superphosphates, and synthetic nitrogenous fertilizers; sources and uses of organic nitrogenous fertilizers, mineral phosphates, bone phosphate and basic slag; American sources of potash fertilizers; principles underlying the purchase and use of fertilizers; the application of fertilizers and their influence on germination and seedling growth; adjusting soil reaction and fertilizer practice to crop requirement. A bibliography, authors' index and general index conclude the volume.

450. THE EFFECT OF CALCIUM ARSENATE UPON THE YIELD OF COTTON ON DIFFERENT SOIL TYPES. By C. Dorman and R. Coleman. (*Miss. Exp. Sta. and*

U.S. Dpt. Agr. *J. Amer. Soc. Agr.*, **31**, 11, 1939, p. 966. From *Exp. Sta. Rec.*, **82**, 4, 1940, p. 478.) Cotton yields on Houston clay loam, Memphis silt loam, Sarpy silty clay loam, and Sarpy fine sandy loam were not affected even after an application of as much as 1,600 lb. of calcium arsenate per acre, but were greatly affected on Ruston sandy loam. Beneficial effects were obtained from light applications and detrimental effects from heavy ones. The arsenic toxicity was, however, reduced with time. Beneficial effects were attributed to the applied calcium acting as a nutrient, the arsenic liberating insoluble phosphorus, and the calcium arsenate stimulating bacterial action. The ability of the unaffected soils to render arsenic insoluble seemed due to their high pH and high colloidal content. The results from these soils, representative of many in the Cotton Belt, indicated that there is very little danger of reducing cotton yields on them with calcium arsenate. Since the average yearly application to cotton hardly ever exceeds 30 lb. per acre, and much is lost every year, accumulation in the soils studied probably never will be enough to inhibit cotton production.

451. PATHOLOGICAL RESEARCH SHOWS INCREASED YIELDS OF COTTON BECAUSE OF TREATMENT WITH CERESAN. (*Miss. Farm. Res.*, **2**, 10, 1939, p. 7. From *Exp. Sta. Rec.*, **82**, 3, 1940, p. 348.) Material increase in germination and yield and decrease in stem lesions by use of 2 per cent. ceresan, and increase in germination and decrease in stem lesions by mechanical delinting of cotton seed are reported. The benefits of the dust treatment were evident even after seventeen months' subsequent storage before planting.

452. THE DYNAMICS OF THE MOBILE FORMS OF NITROGEN IN THE SOIL AND AGROCHEMICAL CONTROL IN COTTON PLANTATIONS. By N. Baliabo. (*Sovet. Khlop.*, **6**, June, 1938, p. 52. From *Cott. Lit.*, Washington, D.C., x., **5**, 1940, p. 240.) "Cultivation of cotton creates conditions favourable to the development of nitrification processes during the whole of the vegetative period, denitrification being almost completely excluded. When no fertilizer is applied the materials necessary for nitrification become exhausted about June or July; from this time on accumulation in the soil of mobile N ceases, and a decrease in food reserves is observed. Owing to the intensity of nitrification processes in cultivated soils they contain very little of the intermediate products of degradation of organic matter (NH₃, nitrites)."

453. SELENIUM IN SOILS AND CROPS. (*Bull. Imp. Inst.*, xxxviii., **2**, 1940, p. 249.) A general review of the literature on the subject, most of which has already been abstracted in the Review.

454. THE OCCURRENCE OF MYCORRHIZÆ, CONSIDERED SYSTEMATICALLY, WITH SPECIAL REFERENCE TO THE EXTENT OF OUR KNOWLEDGE CONCERNING THEM. By A. P. Kelley. (*Landenberg Lab.*, Pa., 1938, p. 12. From *Exp. Sta. Rec.*, **81**, 1, 1939, p. 19.) The author presents a synopsis of mycorrhizal angiosperms, gymnosperms, and pteridophytes, pointing out the limitations of our knowledge of mycorrhizæ and indicating where it might be widened.

STATISTICAL TREATMENT, CULTIVATION, IRRIGATION, GINNING, ETC.

455. METHODS OF STATISTICAL ANALYSIS. By C. H. Goulden. (John Wiley and Sons, Inc., New York. Chapman and Hall Ltd., London. 1939. 17s. 6d. From *Pl. Bre. Abs.*, ix., **4**, 1939, p. 481.) The author has produced a carefully-written and well-documented manual which should go far to satisfy the needs of agronomists and plant breeders, among others. He has solved the difficulty of an opening chapter by dealing at once with the logic of statistical methods, and by introducing the idea of the set-up of an experiment before he discusses

the methods to be used in analyzing the resulting data. The treatment of frequency distributions is on standard lines, but an interesting feature is the early place given to tests of significance with small samples and the design of simple experiments. The treatment of regression and correlation is good, and is taken before tests of goodness of fit. The way is then clear to deal with analysis of variance, after which a long chapter deals with the field plot test, which carries the student up to the most complicated recent examples of factorial and other designs, setting these out in a way that is easy to follow, and making the book an invaluable reference work in this connection, especially as it is profusely illustrated by means of examples. The analysis of variance is applied to linear regression formulæ; the chapter on non-linear regression has a useful comprehensive treatment of the fitting of orthogonal polynomials; and the final chapters deal with analysis of covariance and miscellaneous applications. In addition to the worked examples, exercises are provided at the end of each chapter.

456. STATISTICAL METHODS, WITH SPECIAL REFERENCE TO FIELD EXPERIMENTS. By A. R. Saunders. (*Dept. Agr. Pretoria, S.A., Bull. No. 200.* Price 1s. 1940. From *Farmg. in S. Afr.*, August, 1940, p. 324.) This is the second edition of this bulletin, the first edition being published in 1935. The subject matter follows more or less the same lines, but a good deal of new material has been added.

[Cf. Abstr. 611, Vol. XIII. of this Review.]

457. INCOMPLETE RANDOMIZED BLOCK EXPERIMENTS: STATISTICAL ALLOWANCE FOR MISSING VALUES. By E. A. Cornish. (*Ann. Eugen.*, **10**, 1940, p. 112. From *J. Text. Inst.*, xxxi., **8**, 1940, A467.) The statistical analysis of the results of an experiment arranged with a balanced design is complicated if the balance is upset by the results for individual "plots" (in agricultural experiments) being missing. Formulæ and methods are developed for estimating missing values in incomplete randomized block experiments.

458. THE COMPARISON OF SAMPLES WITH POSSIBLY UNEQUAL VARIANCES. By R. A. Fisher. (*Ann. Eugen.*, Cambs, 1939, **9**, p. 174. From *Pl. Bre. Absts.*, ix., **4**, 1939, p. 371.) The author describes the method of Behrens for testing the hypothesis of equality of the means of two populations whose variances are possibly unequal, and shows how the calculations should be carried out in practice, with the aid of tables.

459. THE VIABILITY OF COTTON SEED AS AFFECTED BY ITS MOISTURE CONTENT. By B. G. Christidis. (*Emp. J. Exp. Agr.*, viii., **30**, 1940, p. 148.) The results of investigations carried out at the Cotton Research Institute, Thessaloniki, Greece, in 1936-38 indicated that cotton seed containing an abnormally high percentage of moisture deteriorates sooner or later according to its moisture content. Such deterioration, which is quite common in countries with rainy weather at picking-time, may be checked efficiently by removing the excess of moisture. Cotton seed can withstand, without loss of vitality, the effects of drying at 60° C. for at least eleven hours, at 70° C. for five and a half hours, 80° C. for ten to twenty minutes, and 90° C. for only two to four minutes. Therefore, about 70 to 75° C. seems the most appropriate drying temperature. The time required to eliminate the excess moisture will depend on the temperature and speed of the current of hot air employed, as well as on the amount of moisture to be removed. A few minutes up to half an hour or more will usually be required. In exceptional cases the drying process may be repeated. It is suggested that in localities where rain falls at picking time all ginning factories should be provided with an appropriate drier to dry the wet seed after ginning.

460. A CULTURA DO ALGODOEIRO E A TÉCNICA DO APROVEITAMENTO DA SUA PRODUÇÃO. By I. Chavirin. (*Ouro Branco*, March, 1940, São Paulo, Brazil.

From *Cott. Lit.*, x., 7, 1940, p. 380.) The cultivation of cotton and the technique of improving its production are discussed.

461. THE PRESENCE OF RESINS IN THE KERNEL OF COTTON SEEDS. By L. A. Tobler. (*Maslo. Zhir. Delo.*, 14, 6, November-December, 1938. In Russian. From *Cott. Lit.*, March, 1940, p. 164.) No saponifiable resins could be detected in the kernel of normal cotton seeds. The resinous acids, isolated by the Wolf esterification method, are traced to the decomposition products of gossypol.

462. EFFECT OF TYPE AND PERIOD OF STORAGE ON COTTON SEED AFTER TREATMENT WITH ORGANIC MERCURY DUSTS. By L. E. Miles. (*Phytopathology*, xxix., 11, 1939, p. 986. From *Rev. App. Mycol.*, xix., 3, 1940, p. 146.) In April, 1937, the average increases of emergence and yield in D. and PL. 11A (Deltapine A) cotton seed treated at the Mississippi Agricultural Experiment Station with 2 per cent. ceresan over the untreated control lots stored for periods from nought up to five months (a) in the laboratory were 26.9 and 26.7 per cent. respectively, and (b) in an outdoor crib 23.3 and 22, the corresponding figures for 2 per cent. new improved ceresan being (a) 18.7 and 26.4 and (b) 30.6 and 26.4 respectively. In April, 1938, the average increases of emergence in two lots of ceresan-treated seed planted immediately after disinfection were 19.2 and 19.3 per cent. and of yield 25.4 and 15.8 per cent., the corresponding figures for new improved being 29 and 29.5 and 30 and 25.8 respectively. For two lots of ceresan-treated seed stored for seventeen months (a) in the laboratory and (b) in the crib, the average increases of emergence were 25.8 and 22.4 per cent. respectively, and of yield 25.5 and 28.7 respectively, the corresponding figures for new improved ceresan being 44.9 and 32.8, 39.1 and 32.6 respectively. It is apparent from these data that neither the type nor the duration of storage caused injury from the treatment, but that the organic mercury dusts, especially new improved ceresan, substantially increased both emergence and yield even though the seed was relatively free from disease. Some factor other than the elimination of seed-borne infection was evidently involved in the production of this effect, probably the reduction of an exceptionally high incidence of the soil-borne sore shin and damping-off fungus (*Corticium solani*).

463. SOME PLOUGHING EXPERIMENTS. By V. R. Ayyar *et al.* (*Madras Agr. J.*, February, 1940, p. 69.) An account of experiments carried out at Koilpatti to test the value of preparatory cultivation of the soil in increasing the yields of cotton and other crops. The results indicated that no significant differences in yield were obtained.

464. COTTON BALES: UPTAKE OF MOISTURE. By P. S. H. Henry. (*Proc. Roy. Soc.*, 1939, A171, p. 215. From *Summ. Curr. Lit.*, xix., 13, 1939, p. 401.) Equations are derived for diffusion in absorbing media, in connection with the uptake of moisture by cotton bales. The problem comprises the diffusion of one substance through another in the pores of a solid body, which may absorb and immobilize some of the diffusing substance, with evolution of heat, which diffuses through the medium and affects the extent to which the solid can absorb the diffusing substance. There are thus two diffusion processes symmetrically coupled by the mutual interaction of the diffusants. The general solution of the problem is shown to be a linear combination of solutions to the ordinary diffusion equation with the same boundary and initial conditions but different diffusion constants. A new solution of the ordinary equation for diffusion into a rectangular parallelopiped is given, and also a table of data for diffusion into a plane sheet from which values for a parallelopiped can be deduced. The expressions derived have been numerically applied to the case of baled cotton at densities 0.2, 0.4 and 0.6 gm. per c.c. As the initial rates of change of weight after a disturbance, due to the main and transient waves, are proportional to

their amplitudes and inversely proportional to their half-value periods, it is found that for a bale of density 0.6 the transient wave may decrease the initial rate of change of weight by about 10 per cent., whereas at a density of 0.2 the initial rate of change is reduced nearly to zero for an hour or two. These effects have not been observed at the Shirley Institute for the case of humidity changes, since it is difficult to change suddenly the relative humidity round a miniature bale without introducing other temporary disturbances which mask the effects sought, but transient waves of the right order of magnitude due to temperature changes with constant relative humidity—that is, in the absence of a main wave—have been observed with miniature bales at the Institute and with full-sized bales by Balls and others in Egypt.

465. THAT COTTON REVOLUTION. By H. P. Smith. (*Coun. Gent.*, **110**, 4, 1940, p. 35. From *Cott. Lit.*, April, 1930, p. 190.) The development of cotton-harvesting machines is noted. Varietal characteristics which influence the efficiency of the machines are described.

466. MECHANICAL HARVESTING OF COTTON AS AFFECTED BY VARIETAL CHARACTERISTICS AND OTHER FACTORS. By H. P. Smith *et al.* (*Bull. Tex. Agr. Exp. Sta.*, No. 580, 1939. From *Pl. Bre. Abs.*, x., **3**, 1940, p. 214.) The characteristics which determine the suitability of a cotton variety for mechanical harvesting are discussed at length, and various relevant field experiments conducted in Texas are reported. The ideal type appears to be a plant with relatively short but numerous fruiting branches with short nodes, no vegetative branches, an open type of growth, light foliage, moderate storm resistance, and large, strong bolls borne singly, with a peduncle which will snap easily under tension, but which will stand considerable plant agitation. Selections along these lines are being made.

467. MECHANICAL COTTON HARVESTER: FACTORS INFLUENCING EFFICIENCY. By H. P. Smith *et al.* (*Texas Sta. Bull.* 580, 1939. From *Summ. Curr. Lit.*, xx., **17**, 1940, p. 429.) An investigation is reported into the most suitable cotton plant habit for harvesting by machinery and into the factors that influence the efficiency of the auxiliary “extractor.” Plant characteristics appear to be more important than mechanical factors or cultural methods. At one experiment station hand-picked cotton was half a grade better than hand-snapped cotton, and $1\frac{1}{2}$ grades better than mechanically-harvested cotton. At another station, where the yield per acre was twice as great, the mechanically harvested cotton was a grade poorer in one season but about the same as the hand-snapped cotton in another season.

468. SOME REGIONAL INFLUENCES ON GINNING PROBLEMS AND METHODS. By C. A. Bennett and F. L. Gerdes. (*Cott. Ginners' J.*, April, 1940. From *Cott. Lit.*, April, 1940, p. 192.) Report of a preliminary study of the ginning problems, machinery and operating practices in two areas differing widely in climatic conditions, type of soil, and production methods by the U.S. Cotton Ginning Laboratory.

469. EFFECT OF CLEANING SEED COTTON ON LINT QUALITY AND GINNING EFFICIENCY. By F. L. Gerdes *et al.* (*U.S. Dept. Agr., Tech. Bull.* 663, 1939. From *Exp. Sta. Rec.*, **81**, 2, 1939, p. 288.) With hand-picked cottons of a wide range of foreign-matter content and staple length, the authors tested a huller front and extractor-feeder with a plain stand, a cylinder cleaner and extractor, and a combination of the cleaner and extractor with a huller stand. The cottons used were practically all below 12 per cent. in moisture content and were mostly of $1\frac{1}{2}$ inches staple or less. Cleaning tests on hand-picked and snapped cottons with equipment ranging from minimum to elaborate combinations of cleaning and extracting devices with a huller gin were also made. Bale-weight decreases

due to cleaning and extracting were not so great as the weights of foreign matter removed. The "fluffed" cotton from the cleaning machines could be ginned closer, offsetting part of the trash weight loss by increased weight of the ginned lint. Improvements of grade as a result of cleaning the seed cotton by the various methods were closely related to foreign-matter removal by the cleaning units. Greater enhancements in grade generally resulted with the shorter than with the longer cottons, and with the cottons of higher than with those of lower foreign-matter content. The measurements of brilliance of the samples gave relationships generally similar to those shown for grade. When the cleaner and extractor were employed singly or in tandem on the cottons of higher foreign-matter content, the quality of the lint ginned with a loose seed roll was increased by an average of one-half of a grade with the shorter and almost one-third of a grade with the longer cottons. The beneficial effects of these units were less with the tight than with the loose seed roll. When cleaning the cotton of low foreign-matter content, changes in grade for the longer staple cotton were negligible, but for the shorter staple cottons the set-ups with the extractor showed some small enhancements. For the third series of tests the improvements from cleaning for the snapped cottons were almost three times those for the hand-picked cottons and increased with the additional cleaners and extractors from 0.5 of a grade with the six-cylinder cleaner set-up to 1.6 grades with the set-up having three cleaners and two extractors. Although the cleaners and extractors greatly improved the grade of lint ginned from the snapped cottons, the most elaborate combination gave an average grade still about one-third of a grade lower than the average grade of the lint ginned from the picked cottons handled by the simple control set-up. The grade of lint was not affected by increasing or decreasing the speed 100 revolutions per minute from the manufacturer's recommended speed with either the extractor-feeder or the air-line or out-of-air cleaners. The use of air-line and out-of-air cleaners gave similar grade results. Differences in ginning time between uncleaned and cleaned picked cotton were generally small except when, in a few instances, the cleaning units so fluffed the cotton that adequate quantities were not fed to the seed-roll box. With the snapped cotton the use of an extractor caused reduction in the ginning time that averaged about 40 per cent. The removal of burs made possible a continuous gin-stand operation. Energy consumption of the gin stand showed only small increases when cleaning the picked cotton, but indicated economies of 16 per cent. or larger when the snapped cotton had been extracted.

470. COTTON SEED: TECHNICAL APPLICATIONS; CHRONOLOGY. By L. W. Bass and H. S. Olcott. (*Chem. Eng. News*, **18**, 1940, p. 139. From *J. Text. Inst.*, May, 1940, A234.) A list is given of important dates in the development and use of the various products obtained from cotton seed.

471. CHANGES OF GOSSYPOL IN THE PROCESS OF COTTONSEED OIL EXTRACTION. By A. M. Goldovskii and M. Z. Podolskaia. (*Maslo. Zhir. Delo.*, **14**, **5**, September-October, 1938, p. 9. From *Cott. Lit.*, March, 1940, p. 163.) (In Russian.) Approximately 10 to 15 per cent. of gossypol contained in the fresh cottonseed meal is dissolved in the process of extraction with benzine. The extract of normal seeds contained 0.32 to 0.43 per cent. gossypol and that of bollie seeds 0.09 to 0.1 per cent. (based on the oil content in the extract).

472. CRUSHING COTTON SEED CO-OPERATIVELY. By J. S. Burgess, Jr. (*Farm Cr. Admin. Co-op. Res. and Serv. Div. Circ.* C114, U.S., 1939. From *Exp. Sta. Rec.* **82**, **3**, 1940, p. 410.) Describes the conditions that should exist before establishing a co-operative cottonseed oil mill, the most desirable organizable structure under various local conditions, and the important operating policies and practices that contribute to the success of such a mill. It is based largely on information regarding co-operative mills already in operation.

473. FEEDING COTTONSEED PRODUCTS. By E. W. Sheets and E. H. Thompson. (*U.S. Dpt. Agr. Bull. No. 1179. From Ind. Farmg., 1, 6, June, 1940, p. 299.*) Untreated cotton seed contains gossypol, which is toxic to animals. This substance is rendered inactive by cooking the seed after the addition of water. Cottonseed meal should be fed to cows with hay, silage, root crops, pasture, or other succulent forage, and any reasonable quantity will not prove injurious. Harmful effects are reported when the roughage fed with the cottonseed meal consisted of cottonseed hulls, wheat straw, or other inferior material. Cottonseed meal or cake can be used for bulls to the extent of from 2 to 4 lb. with other concentrates such as bran, corn, and oats. Calves at one year of age may be fed up to 2½ lb. of cottonseed meal.

PESTS, DISEASES AND INJURIES, AND THEIR CONTROL.

474. AFRICAN TACHINIDÆ—II. By C. H. Curran. (*Amer. Mus. Novit., No. 1022, New York, 1939. From Rev. App. Ent., xxvii., Ser. A, 10, 1939, p. 567.*) The Tachinids described in this paper include *Sturmia halli*, sp.n. bred from larvæ and pupæ of *Heliothis armigera* Hb. (*obsoleta* F.), and *Rhosesina parasitica*, gen. et sp.n. "parasitic on *B. fusca*" (? *Busseola fusca* Fuller), both in Southern Rhodesia.

475. COTTON PESTS IN TANGANYIKA, 1938. (*Ent. Leaflet. No. 17, Dpt. Agr., Tanganyika, 1939. From Rev. App. Ent., 28, Ser. A, 4, 1940, p. 143.*) Cotton pests on the whole were not abundant. Brief notes are given on the distribution of pink bollworm in the Lake Province. *Diparopsis castanea* Hmps. and *Argyroplote leucotreta* Meyr. were found on cotton in the Songea highlands, and *Dysdercus fasciatus* Sign. and *D. nigrofasciatus* Stal. were locally associated with internal boll disease. Infestation by aphids was general, owing to the sudden termination of the rainy season.

476. FIJI: ENTOMOLOGICAL NOTES. By J. A. W. Lever. (*Fiji Agr. J., xi., 1, 1940, p. 16.*) Brief notes, with suggestions for control, of the jassid leaf-hopper and corn-ear worm (*Heliothis armigera*).

477. UNITED STATES: REPORT OF THE CHIEF OF THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE, 1939. By L. A. Strong. (Dpt. Agr., Washington, D.C., U.S.A., 1939.) *Cotton Pests.*—Experiments carried out in various States indicated that calcium arsenate dusts were effective in the control of the boll weevil, cotton flea-hopper, bollworm, and cotton leafworm. In tests with arsenicals, fluorine compounds, fixed nicotine, and phenothiazine dusts for the control of pink bollworm, the best results were obtained with fluorine compounds and fixed nicotine dusts. Root aphids also caused injury to cotton, and there appeared to be a correlation between the presence of the aphids and the incidence of seedling diseases. In control experiments the best results were obtained with paradichlorobenzene. Dusting with calcium arsenate increased aphid population of cotton. Very good progress was made in the eradication of wild cotton in various districts.

478. LATER THAN CUSTOMARY POISONING OF BOLL WEEVILS INDICATED AS PROFITABLE IN COTTON PRODUCTION. (*Miss. Farm. Res., 2, 10, 1939, p. 7. From Exp. Sta. Rec., 82, 3, 1940, p. 365.*) Experiments indicate that calcium arsenate alone gives better control of boll weevil and cotton leafworm than a mixture of half calcium arsenate and half hydrated lime. It is considered that where cotton flea-hoppers and weevils are numerous a mixture of one-third calcium arsenate and two-thirds sulphur would be more profitable than calcium arsenate alone. It is suggested that the best time in the State for the application of calcium arsenate to the cotton plants is about the first week in July, when three applications should be made.

479. EXPERIMENTS USING SEVERAL INSECTICIDES WITH AND WITHOUT WETTING AGENTS AND STICKERS FOR BOLL WEEVIL CONTROL. By C. R. Rainwater. (*J. Econ. Ent.*, **32**, 5, 1939, p. 700. From *Exp. Sta. Rec.*, **82**, 3, 1940, p. 365.) In experiments conducted at Florence, South Carolina, the following insecticides were tested both alone and in combination with different commercial wetting agents and stickers: Calcium arsenate; two nicotine compounds, one containing nicotine bentonite and the other nicotine bentonite plus nicotine tannate; two cryolite dusts, one finely ground and the other coarsely ground; a mixture of calcium arsenate and calcium carbonate not combined with a sticker or spreader. Results indicated that none of the wetting agents and stickers increased the effectiveness of the calcium arsenate or the nicotine compounds. A synthetic liquid sticker and spreader (lethane) increased the effectiveness of the fine cryolite and made it comparable to calcium arsenate. Calcium arsenate, used alone or in combination with stickers and spreaders, and the fine cryolite were superior to the nicotine compounds with or without stickers and spreaders. No significant difference occurred between calcium arsenate and calcium arsenate-calcium carbonate mixture.

480. OBSERVATIONS ON THE LARVAL DIAPAUSE OF THE PINK BOLLWORM, *Platyedra gossypiella* SAUND. By F. A. Squire. (*Bull. Ent. Res.*, **30**, 4, 1940, p. 475. From *Rev. App. Ent.*, xxviii., Ser. A, **8**, 1940, p. 408.) An account is given of further experiments in the West Indies on the larval diapause of *Platyedra gossypiella* Saund., which was previously shown to be independent of seasonal or climatic conditions and caused by food of low moisture content. It was found in St. Vincent that there was a rapid decline in the moisture content of the seed after the bolls had split, resulting in a reduction in the average percentage moisture content of the food of the larvæ from 75 for those penetrating the seed fourteen days before the bolls split to 29.9 for those entering two days before. The percentage of larvæ that diapaused varied from 5.2 when the food contained 70 to 80 per cent. moisture to 62 when it contained 0 to 20 per cent. Counts on successive days showed that the percentage of immature larvæ in bolls rose with an increase in the ratio of ripe to green bolls. The other experiments were with larvæ collected in Montserrat. When cotton-wool in which resting larvæ had spun up was saturated with water on December 11 and 29, pupation took place in two waves about six to nine days after each wetting, and 80 per cent. of the surviving larvæ had pupated by the end of January, as compared with 3.8 per cent. in dry cotton-wool. When resting larvæ in dry cotton-wool were kept for different periods at relative humidities of 90 or 60 per cent., the percentage pupating in each period was significantly greater at the higher humidity. Of 3,000 resting larvæ collected between mid-October and mid-November, 1937, when the temperature was 70 to 90° F. and the relative humidity 54 to 70 per cent., and kept under conditions similar to those in dilapidated ginneries, cotton houses, and peasant dwellings, almost a third were still in diapause at the end of April. The author concludes that since the survival of resting larvæ in the soil and in cotton residues in the field is favoured by dry conditions, the close season for cotton should fall in wet months, where this is practicable, and that since the resting larvæ are able to survive the close season in buildings, owing to the sheltered habitat, it is important that sanitary conditions should be maintained in ginneries and cotton houses as well as in peasant dwellings in which cotton is kept and sorted.

481. IRAN: FIRST OUTBREAK OF THE PINK COTTON BOLLWORM (*Pectinophora [platyedra] gossypiella*). By A. H. Adle. (*Int. Rev. Agr.*, **13**, 7, 1939, p. 154. From *Rev. App. Ent.*, Ser. A, **3**, 1940, p. 96.) *Platyedra gossypiella* Saund. was first reported on cotton in Iran in 1937, and has since been found to occur

in a number of districts in the south-east. Legislation providing for its control was enacted in June, 1938. In the affected area the growing of cotton is prohibited for several years, and standing crops must be burned. Probable areas of infestation must undergo periodical inspection, and if found to be infested the crops must be burned. Provision is made for the disposal of all cotton seed existing in the regulated area, and in general the transport of cotton from southern to northern districts is prohibited. Cotton from each region must be ginned separately and the waste burned.

482. BIOLOGIA DE *Calliephialtes dimorphus* CUSHM. (HYM. ICHN.), UM INTERES-SANTE PARASITA PRIMARIO DE *Platyedra gossypiella* SAUND. By H. F. G. Sauer. (*Arg. Inst. Biol.*, **10**, p. 165. S. Paulo, 1939. Summary in English. From *Rev. App. Ent.*, xxviii, Ser. A, **8**, 1940, p. 377.) Laboratory investigations were carried out at Campinas, São Paulo, Brazil, in 1938-39 on the bionomics of *Ephialtes* (*Calliephialtes*) *dimorphus* Cushman, which is widely distributed in Southern Brazil and parasitizes *Platyedra gossypiella* Saund. on cotton and *Myelois decolor* Zell. on coffee. Descriptions are given of all stages of this Ichneumonid, the technique by which it was bred, the processes of pairing, oviposition and pupation, and the way in which the females feed on the host larvæ. The host used in the laboratory was *P. gossypiella*; investigations on alternative hosts showed that although females oviposited on the larvæ of several species, the only one on which the parasite was able to complete its development was the Pyralid, *Leucinodes elegantalis* Gn. Males were somewhat more numerous than females in the field and in the laboratory. Adult longevity varied considerably even under identical conditions of temperature and food, but was in the main dependent on temperature; it was considerably reduced above 23° C. (73·4° F.). Of females kept at an average temperature of 18·4° C. (65·12° F.), and provided with various combinations of food, those given water, concentrated sugar solution and host larvæ survived the longest (average 48·4 days); the average longevity of males under similar conditions was 22 days. Pairing, which sometimes took place immediately after emergence and sometimes repeatedly, occurred under very varied conditions and at all temperatures between 17 and 30° C. (62·6 and 86° F.). The interval between pairing and oviposition varied between 6 and 19 days, and averaged 14·6. Females oviposited at temperatures between 20 and 30° C. (68 and 86° F.), and normally laid one egg on or near each host. In the insectary as many as eight were laid on a single host, but of these only one gave rise to an adult. The duration of the oviposition period varied from 14 to 101 days, with an average of 31·6, and females deposited 14 to 369 eggs, with an average of 100·7 at the average rate of 3·18 per day. Unfertilized females oviposited, giving rise to males only. The duration of the egg stage at different times of the year averaged 2 days; it varied very little at temperatures between 18·8 and 25° C. (65·84 and 77° F.). On hatching, the larvæ attach themselves to the hosts and feed on the body contents. They did not survive long without food. They fed on the host for an average of about 6 days, leaving only the integument, and then entered a resting stage during which they spun cocoons. The complete larval, prepupal and pupal stages averaged 12·4, 2·6 and 9·5 days respectively. The duration of the life-cycle from egg to adult depended largely on temperature; at 24° C. (75° F.) it was about 18 days, and was somewhat longer for females than for males. In the insectary, where breeding was continuous, eight generations were obtained in a year, but only four were observed in the field. Females feed on the host larvæ throughout their life, and kill an average of three to five a day. The males sometimes feed on the remains of larvæ left by the females. The ovipositor of the female is very long, but as it is unable to pierce resistant surfaces it is able to reach the host only through an aperture. The adults appear in the cotton fields during

May and are most abundant in August and September, when the cotton bolls have opened and afford access to the host larvæ, which at that time are mostly hibernating. No parasites were observed in the field in summer; laboratory experiments showed that this was not due to a diapause. In a brief discussion of the importance of *E. dimorphus* in the control of *P. gossypiella* it is stated that the average percentage parasitism by it in cotton fields at Campinas in the period April to November, 1938, reached its maximum (3.85) in October. Its efficiency is limited by the practice of rooting out and burning the remains of the cotton crop at the time of its greatest activity, and by its apparent absence from cotton fields during the summer. It is also destroyed in coffee plantations by the methods adopted against *Stephanoderes humpei*, Ferr.

483. EL *Alabama argillacea* EN LA ZONA ALGODONERA DE ARMERO. By V. V. Llanos. (*Rev. Fac. Nac. Agr.*, Colombia, **1**, 2, 1939, p. 149. From *Rev. App. Ent.*, xxviii., Ser. A, **6**, 1940, p. 318.) An account is given of observations on the life-history and control of *Alabama argillacea*, Hb., on cotton in the Armero district of Colombia, and all stages of this Noctuid are described. It has twelve generations a year in Armero, and six were observed in the crop season from September, 1937, to February, 1938. The durations of the egg, larval, prepupal and pupal stages averaged 3, 10, 1½ and 8 days, and females began to oviposit 2 days after emergence. Adult longevity varied from 3 to 12 days. Some plantations are free from attack, though surrounded by infested fields, and this is believed to be due to natural enemies. Those observed included two species of *Polistes*, three Pentatomids, three Sarcophagids, *Brachymeria comitator*, Wlk., and another Chalcid of the same genus. Of these, *B. comitator*, which parasitizes the pupæ, was the most important. Its development is completed in 15 days, and as the adult lives for 85 days it can parasitize three successive generations of *A. argillacea*. The only insecticide used is a dust of undiluted calcium arsenate, and as this is expensive it is suggested that it should be mixed with lime.

484. INVESTIGATIONS ON THE COTTON BOLLWORM, *Heliothis armigera*, HÜBN. (*obsoleta*, FABR.). PT. II. THE INCIDENCE OF PARASITES IN QUANTITATIVE RELATION TO BOLLWORM POPULATIONS IN SOUTH AFRICA. By F. S. Parsons. (Reprinted from *Bull. Ent. Res.*, xxxi., **1** and **2**, 1940.) *Egg Parasites*.—In the Eastern Transvaal, Swaziland and Natal the eggs of *Heliothis armigera* are parasitized by *Trichogramma luteum*, Gir., and *Telenomus (Phanurus) ullyetti*, Nixon. No other egg parasites have been encountered. Representative samples of eggs were collected weekly or twice weekly over a period of seven years and over wide areas from the various cultivated crops and colonies of wild food-plants which exemplify the annual chain of breeding sites of *H. armigera*. The collected eggs were incubated to determine the "active" fraction derived after withdrawal of the infertile portion, and of eggs exposed for less than twenty-four hours to parasitic action. Observed parasitism was computed against the "active" eggs, and is regarded as an index of the parasitism in the field. Running indices of this nature are given graphically to indicate the annual incidence of egg parasitism in percentages, which may be viewed in relation to the incidence of bollworm as evinced by oviposition data in the figures given. Sustained high levels of parasitism are associated mainly with the more abundant egg populations on winter-irrigated vegetable crops grown between July and November. It has been found that *Telenomus* occurs mainly in the period August to December, and *Trichogramma* in the period December to March-April. The high parasitism of the winter egg populations is due, therefore, almost solely to *Telenomus*. Evidence is submitted that the levels of parasitism in certain crops are commonly much higher than in others. Explanations are suggested by consideration of sites of egg deposition, accessibility of eggs, plant habit, vegetative and flowering,

and particularly the known oviposition-flowering relationship of *Heliothis* moths. The latter has an important bearing on the persistence of host material and governs opportunity for the intervention of parasite progeny in increasing numbers. Records on the status of egg parasitism have been taken in conjunction with investigations of the extent of larval mortality associated with the various types of crop. The rôle of egg parasites as agents reducing the issue of moths from winter and spring breeding areas is discussed briefly. Comparisons are given to show that the influence wielded is inappreciable even in some cases where parasitism is particularly high.

Larval Parasites.—The identity and incidence of parasites of *Heliothis* larvæ in the Eastern Transvaal, Natal and Swaziland were determined from observations on samples of larvæ collected weekly or bi-weekly from the wild and cultivated food-plants that supply the annual chain of breeding sites of *Heliothis armigera*; records for five years (1934-39) are discussed. The samples of larvæ were representative except as regards the proportions of first and second instars, which are detected with varying difficulties. Mortality following upon symptoms resembling those of polyhedral disease was a complicating factor, but disease-free periods were frequent enough and of sufficient length to permit the identification of the parasites present, the stadia attacked, and to supply information on season and food-plant associations. Estimates of the degrees of parasitism were obtained. Nineteen parasites are listed. Thirteen of these were of infrequent occurrence and only 5 per cent. of the total parasitism was attributable to them; some particulars of these minor parasites are given. Information on the major parasites is recorded more extensively, and references to their individual participation are made. The subject of larval parasitism is presented from two main points of view—viz., (1) the rôle of parasites in reducing the scale of bollworm attacks, (2) the part played by parasites in destroying mature larvæ and pupæ, and thus lessening moth production. Evidence on (1) is submitted, firstly, for parasitism over the whole of the bollworm population. It is shown that parasitism rarely exceeded 25 per cent., commonly it was less than 10 per cent., and frequently less than 5 per cent. The levels of parasitism do not exhibit seasonal trends. Secondly, data are given for the mean parasitism of the larval populations on each of the main varieties of crop and for wild food-plant breeding areas; lower parasitism is associated with the larvæ from cucumber, tomato and marrow crops. Cotton-bred larvæ were most heavily parasitized. Little differences were found for the remainder. It is recognized that the part played by parasites cannot be appreciated fully unless viewed in conjunction with other factors affecting larval mortality, to be discussed in a future paper. Evidence on (2) is submitted for the winter, intermediate and summer breeding grounds. There is no larval survival on cucumbers nor, in most cases, on tomatoes, and parasitism rarely applies. Little or no parasitism was found in mature larvæ and pupæ derived from the marrow crop. As in this case the survival to maturity is particularly high, an outstandingly large moth production is indicated; similarly for peas over a larger acreage. In the winter series of crops only mature larvæ from beans were heavily parasitized, parasites emerging mainly from the pupæ. There was a notable reduction of larvæ and pupæ produced in early maize, but little diminution in this regard was found for the predominant wild food-plant breeding grounds, from which the moths concerned in the first bollworm infestations of cotton are mainly derived. Summer-grown maize has a relatively lower propensity for moth production than cotton.

PT. III. RELATIONSHIPS BETWEEN OVIPOSITION AND THE FLOWERING CURVES OF FOOD-PLANTS. Studies of the food-plant associations of *Heliothis armigera* have elicited the information that, for all practical purposes, egg-

laying may be considered as confined to the period of florescence. Evidence of coincidence of the oviposition and flowering curves is submitted for twenty-one species of short-flowering crops and eight species of long-flowering crops. All told, records taken in nearly 1,000 crops have been consulted for the conclusions drawn. As regards short-flowering species, the peaks, as well as the confines, of the oviposition and flowering curves are related closely. But oviposition on long-flowering species may decline while flowering is still in progress, or two or more waves of oviposition may be evident according to the number of moth flights spanned by the flowering period. The courses of oviposition on long-flowering species of crop in the given instances are interpreted through knowledge of the train of moth flights; although egg-laying in quantity occurs within the flowering period, peak layings frequently are not aligned with maximum flower production because the calendar times of moth flights are displaced in relation thereto. Variations of the relationships are noted and their causes discussed—viz., the influence of counter-attractive crops, fluctuations in the moth population, overlap of flowering and moth flight curves, inter-crop movement of moths, discrimination by the egg-laying moths between varieties and strains of a plant species. Diversion of moths in response to the greater attraction of a neighbouring crop is the most frequent cause of variations, and examples are given with special reference to cotton. Several of the causes of variation operate in layouts of randomized plots, and in their results increase the difficulties of the experimentalist and plant-breeder to a degree that they may fail to appreciate when judging the relative merits of strains and treatments. Exceptions to the relationships are noted. Their detection was incidental to the purposes and scope of the work on bollworm food-plants at hand. Attempts have not been made to enlarge material and prosecute studies as regards exceptions *per se*. Attention is drawn to the utility of the relationships in respect to (a) their immediate utility in attempts at evasion and control, (b) the exceptional aids they afford to the study of subjects bearing at longer range on a proper understanding of the bollworm problem, (c) their offer of initial guides to study of the nature of the attraction. In connection with (c) the results of preliminary tests for olfactory perception by the moths of steam distillates and alcohol extracts from flower materials from different sources are communicated, as they encourage further and more precise investigation. It is suggested that food and oviposition responses are distinct. Whether the moths are actuated primarily by perception of the more complex flower scents and recognize differences that lie at the base of food-plant preferences remains to be established. It is, however, noteworthy that the timing of oviposition with flowering results in the larvæ having access to food which favours optimum reproduction of the species. Thus, apart from questions of the means of perception, the relationships manifest instinctive behaviour. Finally, particulars are given of the times and extent to which eggs were disseminated on a number of flowering crops and wild food-plants in small acreages on a native holding in the Swaziland Protectorate. The cotton received a comparatively light laying (the year was one of exceptionally heavy bollworm attack on unprotected European-grown cotton), and the findings would seem to confirm the views of workers in other parts of Africa that counter-attractant influences in the multiple-cropping systems of natives there serve to protect the cotton from this pest. Possibilities that the area of native-grown cotton might be enlarged at the expense of preferred food-plants of *H. armigera*, with a consequent increase in its status as a cotton pest, are touched on.

[*Cf.* Abstr. 196, Vol. XVII. (June), 1940, of this Review.]

485. SEASONAL ABUNDANCE OF THE CORN-EAR WORM. By F. F. Dicke. (*J. Agr. Res.*, 59, 4, 1939, p. 237.) A study of the general seasonal abundance of the corn-

ear worm (*Heliothis armigera*, Hbn.) in central Virginia and the territory adjacent to the District of Columbia. The great mass of the corn-ear worm population occurs on corn, which is generally agreed to be the preferred host plant, the fresh silk being the most attractive part of the corn plant for oviposition. Except in the late-maturing fields, where egg-laying is prolonged because more attractive host material is not becoming available, in a particular cornfield oviposition reaches its maximum at or shortly after the time when the corn reaches its maximum silking stage. The moths emerging from hibernating pupæ early in the season, before corn becomes attractive for oviposition, deposit eggs on a variety of hosts, a common one being tomato. With the appearance of early attractive corn there is a shift to this plant, and the insect remains concentrated on corn for about two months, or until the grain in late-maturing fields hardens, when there is again a decided shift to a variety of hosts, common examples of which are tomato, alfalfa, and particularly cotton in the South.

The author states that the correct scientific name for the corn-ear worm is now considered to be *Heliothis armigera* Hbn., and not *H. obsoleta* F.; it is also called the cotton bollworm and the tomato fruitworm.

486. CONTROL OF THE CORN-EAR WORM ON FORDHOOK LIMA BEANS IN EASTERN VIRGINIA. By L. W. Brannon. (*Circ. U.S. Dpt. Agr. No. 506*, Washington, D.C., 1939. From *Rev. App. Ent.*, xxvii., Ser. A, **11**, 1939, p. 595.) The author recommends three or four applications, at intervals of a week or ten days, of a dust of cryolite, either undiluted (10 to 12 lb. per acre) or mixed with 40 per cent. (by weight) of sulphur or talc (20 to 25 lb. per acre), or of a spray containing 3 lb. cryolite in 50 U.S. gals. water. The first application should be made when most of the silks on maize near late plantings of lima beans have dried, but before the beans are in full bloom. A bait of 1 lb. cryolite mixed with 25 lb. maize meal broadcast evenly over the leaves at the rate of 50 lb. per acre at the same intervals as the other treatments is effective against *Heliothis armigera*, but not against *Epilachna varivestis*.

487. *Helopeltis* DU KIVU ET DE L'ITURI. By J. Ghesquière. (*Rev. Zool. Bot. Afr.*, **33**, 1, p. 67. Brussels, 1939. From *Rev. App. Ent.*, xxviii., Ser. A, **8**, 1940, p. 437.) Of the species of *Helopeltis* that occur in the eastern region of the Belgian Congo, *H. alluaudi* Reut., which attacks cotton, cacao, and *Capsicum*, was observed in 1937 puncturing the leaves of coffee in two localities in the region. *H. bergrothi* Reut., infests cotton, cacao, and leguminous cover crops in Ituri and Kivu, where it has been confused with another species, *H. orophila*, sp.n., which of recent years has increased in numbers at an alarming rate in plantations of cinchona, and has also been recorded from tea and eucalyptus. The adults of both sexes of this species and four colour forms of it are described, and characters distinguishing it from *H. bergrothi* are given.

488. INFORMES DEL DEPARTAMENTO DE ENTOMOLOGIA DE LA ESTACIÓN EXPERIMENTAL AGRICOLA DE LA MOLINA. By J. E. Wille. (*Bol. Dir. Agr. Ganad. Peru*, **9**, 1938, No. 28. From *Rev. App. Ent.*, xxviii., Ser. A, **6**, 1940, p. 280.) In 1937, *Hippodamia convergens* Guer. was imported into Peru from California and released against aphids on citrus and cotton. The Coccinellid failed to establish itself, apparently owing to the moist climate, but the closely allied species, *Cycloneda sanguinea* L., was abundant and gave good control of the aphids.

489. COTTON ROOT APHID: LIFE-HISTORY. By C. F. Rainwater and N. Allen. (*J. Econ. Ent.*, **32**, 1939, p. 557. From *Summ. Curr. Lit.*, xx., **14**, 1940, p. 346.) A statistical analysis is reported of the relationship of temperature to (1) the rate of reproduction, (2) length of adult life, and (3) the development period of a new cotton root aphid *Rhopalosiphum subterraneum* Mason. The relationship

of the average mean temperature is positive and linear with (1), negative and linear with (2), and parabolic with (3).

490. CONTRIBUTION TO THE BIOECOLOGY OF THE SPIDER MITE. (Preliminary data.) By F. M. Uspenskii. (In Russian.) (*Trud. sredneaz. Sta. Zashch. Rast.*, **2**, p. 3. Tashkent, 1937. From *Rev. App. Ent.*, xxvii., Ser. A, **12**, 1939, p. 625.) The effect of temperature and humidity on infestation of cotton by the red spider (*Tetranychus turkestanii* Ugar. and Nik.) was studied in Uzbekistan in 1935. From a comparison of data recorded in July-September, 1935, by meteorological stations in Kokand (Northern Uzbekistan) and Ashkhabad (Southern Turkmenistan), with data on the fluctuations in the increase in the growth of infested cotton plants in selected plots there, the author concludes that the optimum conditions for a mass increase of the mite on cotton occur when the stations record a temperature of 29 to 30° C. (84.2 to 86° F.) and a relative humidity of 35 to 40 per cent. Infestation is considerably reduced by the Coccinellid, *Stethorus punctillum* Weise, which in 1935 practically eliminated the mite on cotton near Samarkand.

[Cf. Abstr. 113, Vol. XVI. of this Review.]

491. INDIA: STUDIES OF COTTON PESTS. (*Sci. Rpts. Imp. Agr. Res. Inst.*, 1938-39, New Delhi, 1940, p. 13.) The rate of development and power of reproduction of *Earias fabia* (spotted bollworm), a destructive pest of cotton, and its most important parasite, *Microbracon lefroyi*, were studied at several constant temperatures ranging from 15 to 50° C. under different saturation deficiencies. Long-continued exposures to a temperature of 13° C. or below have, in the laboratory, proved fatal to both species, contrary to the common belief that severe winters are more injurious to the parasite than to the host. At the various temperatures tried within the vital limits, the parasites developed two to two and a half times faster than the pests. It is a common observation that during years of good rain spotted bollworms are not very abundant in the field, and the phenomenon is ascribed to the mechanical action of rain in shaking off attacked buds and bolls and drowning the bollworms living therein. The work carried out in the laboratory at the Institute indicates that it is not solely the mechanical effect of rain which is useful, but that summer rains help in controlling the pest by lowering the temperature, which is beneficial to the development and viability of the parasite, and by raising the humidity, which is injurious to the host. High temperature and low humidity during the summer have been observed to be the chief limiting factors in the multiplication of the parasites in the field. *Melcha nursei*, another parasite of great potential importance, appears to have vital limits of temperature and humidity identical with those of *Microbracon lefroyi*.

492. DIPHENYLAMINE PROMISING AS SOIL POISON AGAINST SUBTERRANEAN TERMITES. By M. W. Smith. (*J. Econ. Ent.*, **32**, **4**, 1939, p. 597. From *Rev. App. Ent.*, xxviii., Ser. A, **4**, 1940, p. 183.) The effects of ten organic compounds on subterranean termites were compared with those of orthodichlorobenzene as the standard by the method of G. L. Hockenyos, washed sand being substituted for soil. In this paper the results obtained with diphenylamine, which were outstanding, are dealt with. Ground mixtures of sand and crystals were used. When used at the rate of 1 part to 250 parts sand, by weight, orthodichlorobenzene killed the termites more rapidly than diphenylamine, but after seventy-two hours the former no longer killed the fresh termites nor prevented penetration, whereas the latter was as effective as at first, or more so. At rates of 1 : 500 and 1 : 1,000 orthodichlorobenzene did not kill the termites, but prevented penetration for sixty and forty-eight hours respectively, whereas diphenylamine was almost as effective at either concentration as at 1 : 250. Concentrations of 1 : 2,000, 1 : 4,000, 1 : 8,000 and 1 : 10,000, with a layer of untreated sand 5 mm. deep

covering the treated sand, prevented penetration and killed the termites. The lowest concentration did not lose its effectiveness until five months had elapsed, and the 1 : 8,000 concentration was still effective after seven months (when this paper was written). In the controls, termites penetrated the moist sand within an hour and remained alive for at least three months, when the controls were discontinued. Further tests indicated that to be effective in soil, dichlorobenzene must be used at higher concentrations than in sand. In a preliminary experiment on leaching it was not easy to wash the diphenylamine from the upper to the lower layers of sand.

493. FINAL REPORT ON THE SCHEME OF INVESTIGATION ON THE WHITE FLY OF COTTON IN THE PUNJAB. Part VI. By M. A. Husain and K. N. Trehan. (*Ind. J. Agr. Sci.*, x., 2, 1940, p. 101.) During the five years that the scheme has run, a thorough study of the external characters, life-history and bionomics of the white fly of cotton has been made, its seasonal activities have been studied, and the nature and extent of damage done by it to the cotton crop has been assessed. The pest is widely distributed in the Punjab, but the most serious attack is confined to the so-called "canal colony tracts." The white fly, however, is not the main factor in causing "cotton failure" in the Punjab. Rosin compound proved to be the most satisfactory insecticide.

[Cf. Abstr. 455, Vol. VIII.; Abstr. 251, Vol. XI.; Abstr. 118 and 301, Vol. XIV.; Abstr. 501, Vol. XVI., of this Review.]

494. REPORT OF THE GOVT. MYCOLOGIST, MADRAS, 1938-39. By K. M. Thomas. (*Rev. App. Mycol.*, xix., 5, 1940, p. 259.) Cross inoculations with *Colletotrichum indicum* from diseased cotton bolls on plants other than *Gossypium* gave positive results only on wounded chilli fruits. Delinted cotton seeds soaked in a spore suspension of *C. indicum* and sown in germination trays gave 24 per cent. germination, as against 80 per cent. for the uninoculated controls. Inoculated seeds sown in sterilized soil also showed reduced germination, the seedlings being diseased. The disease may be carried through the soil. The fungus grew well on media containing sucrose, maltose, or glucose, and readily utilized nitrogen in the form of asparagin, peptone, or potassium nitrate. As the proportion of carbon to nitrogen declined, so growth was reduced, the optimum occurring near 30°. Cotton seedlings placed in a filtrate of the fungus wilted.

495. APPLIED MYCOLOGY AND BACTERIOLOGY. By L. D. Galloway and R. Burgess. (London: Leonard Hill Ltd., 1940. Second printing. From *J. Text. Inst.*, xxxi., 8, August, 1940, p. 87.) This book was reviewed in 1938, and in this second printing the authors have revised the text in many small ways. They have also added to the lists of references to guide readers in a wider study of the subject, and have introduced a few new illustrations prepared by themselves with the aid of microscope and camera. Outwardly the book appears to be entirely new, but this is due to the fact that it is now printed on coarser paper and is thus one and a half times as thick as at the first issue.

[Cf. Abstr. 199, Vol. XV. of this Review.]

496. SOME RECENT INVESTIGATIONS ON EPIDEMIC PLANT DISEASES. By F. T. Brooks. (*Rpt. Aust. Ass. Adv. Sci.*, xxiv., 1939, p. 290. From *Rev. App. Mycol.*, xix., 8, 1940, p. 486.) The author discusses the relations of parasites to their host plants, especially from the standpoint of the establishment of disease in epidemic form, and deals with the influence of one parasite on the incidence of another.

497. SOUTH AFRICA: EXPERIMENTAL WORK IN 1938-39. (*Farmg. in S. Afr.*, December, 1939, pp. 540 and 545.) *Empusa grylli* caused a certain amount of mortality in locusts kept in cages for experimental purposes, and advantage was taken of the fresh spores available to make a further attempt to cultivate

the fungus in culture media. A wide range of the latter was used, and although the length of germ tubes produced exceeded that previously recorded, no further growth was obtained.

Experiments were continued during the season in connection with fluorine insecticides, such as cryolite and sodium fluosilicate, with a view to ascertaining whether any danger attached to the practice of treating citrus trees with these remedies against American bollworm. The work has been under way for three years, since there is a slight possibility that the effect may be cumulative.

498. A DESCRIPTIVE LIST OF PLANT DISEASES IN SOUTHERN RHODESIA, AND THEIR CONTROL. By J. C. F. Hopkins. (*Mems. Dpt. Agr. S. Rhod. No. 2*, 1939.) The cotton diseases listed include boll rots, internal boll disease, leaf spot, seedling blight, sooty mould, sore shin, and yellow lint rot.

[Cf. Abstr. 503, Vol. XVI. of this Review.]

499. *L'Aspergillus alliaceus*, THOM ET CHURCH, ISOLATO DA CAPSULE DI COTONE COLTIVATO IN SICILIA. By G. Goidanich. (*Boll. Staz. Pat. Veg., Roma*, N.S., xix., **4**, 1939, p. 488. From *Rev. App. Mycol.*, xix., **7**, 1940, p. 404.) In 1938 the author isolated *Aspergillus alliaceus* from Sicilian cotton bolls. Infection was general throughout the carpellary column and extended to the carpels. The part of the fibre in which mycelium was present was light yellow, indurated, and mummified. A full description of the morphology of the fungus is given and experimental inoculations of its natural host, garlic, are stated to have produced slow but serious infection, which was clearly favoured by high humidity.

500. A SURVEY OF COTTON BOLL ROT DISEASES IN 1939 AND THE MICRO-ORGANISMS ASSOCIATED WITH THEM. By P. R. Miller and R. Weindling. (*Pl. Dis. Rptr.*, xxiii., **20**, 1939, p. 329. Mimeographed. From *Rev. App. Mycol.*, xix., **4**, 1940, p. 212.) The results (which are tabulated and briefly discussed) of a survey carried out during 1939 in the cotton-growing regions of the United States to ascertain the prevalence and relative distribution of the fungi associated with boll rot confirmed the previous evidence of the prevalence of *Glomerella gossypii*. This species was present in 82.3 per cent. of the fields examined, or in 90.1 per cent. if Texas and Oklahoma are omitted. It was obtained in culture from 29.9 per cent. of 2,959 bolls, but was found in fewer bolls from Louisiana and Arkansas than from more easterly States (3.8 and 5.1 per cent. respectively, as against 33.2 per cent. in Mississippi and 34.7 per cent. in Alabama). An interesting result of the survey was the evidence of the prevalence and frequency of *G. gossypii* in the eleven cotton States east of Texas and Oklahoma and its apparent absence to the west of this region; it may be significant to note the apparent correlation of the general extent of the disease with high humidity. The other boll rot organisms most frequently found were again *Alternaria* spp., *Fusarium moniliforme* (*Gibberella fujikuroi*) and *F.* spp.

501. SECÇÃO DE FITOPATOLOGIA. O INSTITUTO DE PESQUISAS AGRONOMICAS DE PERNAMBUCO. By R. B. McCormack. (*Rodriguésia*, iv., **12**, 1939, p. 30. From *Rev. App. Mycol.*, xix., **3**, 1940, p. 135.) Among the phytopathological problems occupying the attention of members of the Pernambuco (Brazil) Institute of Agricultural Research (stated in a foreword by A. B. Fagundes to have been founded on September 7, 1935) are the following: Heavy losses are caused by boll rots of cotton, associated with species of *Aspergillus*, *Penicillium*, *Nematospora*, a pink *Fusarium*, yeasts, and in some cases with bacteria entering through the perforations made by insects, chiefly *Platyedra gossypiella*. Injuries of this type are specially prevalent under humid conditions. Most boll rots are initiated by insect infestation, an exception being that due to *Rhizopus nigricans*. Leaf rust (*Cerotelium desmium*) occurs in a destructive form in parts of the State, inducing premature defoliation and thereby lowering the output of the crop. Areolate

mildew (*Ramularia areola*) [*Cercospora gossypii*] is widespread but unimportant. Red leaf, a physiological disturbance, is troublesome on soils deficient in potash. Young stands are liable to decimation by sore shin or damping-off (*Corticium vagum*) [*C. solani*], while a *Rhizoctonia* is responsible for a root rot of cotton and beans (*Phaseolus vulgaris*). *F. vasinfectum* was isolated from two wilted plants in an experimental plot in November, 1936, since when the disease has spread to a considerable extent. Although the percentage of transmission by means of the seed is low (2 to 4), this channel is of great importance in the introduction of infection into hitherto healthy sites. Preliminary experiments in the sterilization of the seed with sulphuric acid have given promising results.

502. FIRST PROGRESS REPORT ON THE PHYMATOTRICHUM ROOT ROT LOSSES IN EXPERIMENTAL WINDBREAKS OF OKLAHOMA AND TEXAS. Ry E. Wright. (*Pl. Dis. Rptr.*, xxiv., 1, 1940, p. 13. Mimeographed. From *Rev. App. Mycol.*, xix., 7, 1940, p. 403.) During 1939 some 27 miles of experimental windbreaks planted in Oklahoma and Texas were inspected for root rot due to *Phymatotrichum omnivorum*. Of the total mileage, about 7 miles were critically examined, detailed notes being made on the losses of the different species. The evidence obtained (which is tabulated) demonstrated that *Ailanthus altissima* showed nearly 100 per cent. survival in a locality where severe infection was present. *Juglans nigra*, *J. major*, soapberry (*Sapindus drummondii*) and apricot also showed resistance. It would appear that no species that can be used in windbreaks on infected soil will prove to be immune. In general seedlings are more susceptible than older trees.

503. TEXAS: PLANT PATHOLOGY AND PHYSIOLOGY. (*Rpt. Texas Agr. Exp. Sta.*, 1938. From *Rev. App. Mycol.*, xix., 9, 1940, p. 518.) W. N. Ezekiel states that rainfall during the growing season was favourable to cotton root rot, *Phymatotrichum omnivorum*, causing a reduction in yield estimated at about 7.6 per cent. of the normal. In laboratory studies by L. M. Blank some seventeen carbohydrates were tested as carbon sources for *P. omnivorum* in a nutrient solution. The relationship between the utilization of various carbohydrates and the ability of the fungus enzymes to digest these carbohydrates was very close. The addition of zinc, iron, or manganese in small amounts to the nutrient solution resulted in considerable increases in growth of the fungus, whereas others, particularly copper, cobalt and nickel, were toxic even at low concentrations. G. E. Allstatt and A. L. Burkett report that treatment of seeds with ceresan gave positive results against *Bacterium malvacearum*, *Fusarium moniliforme* (*Gibberella fujikuroi*), and *Glomerella gossypii*; treated seeds gave increased stands, but differences in yield were insignificant.

504. PLANT DISEASE WORK BY THE TEXAS STATION. (*Texas Sta. Rpt.* 1938. From *Exp. Sta. Rec.*, 82, 4, 1940, p. 498.) Work on cotton included studies of the conditions affecting the local prevalence of root rot; studies of the life-history of the causal fungus, *Phymatotrichum omnivorum*; the cause of immunity of monocotyledons to it; girdling of cotton plants as affecting survival of the fungus; field studies of resistance in cotton; nutrition of the fungus and the effects of certain metallic ions on its growth; cotton-seed treatments for fungus and bacterial diseases; regional cotton wilt variety studies; the effect of continuous cotton, corn, sorghum, and oats on the number and viability of root rot sclerotia, root rot in cotton planted for a second successive year in a native meadow; effect of oil and cotton burr ashes on cotton root rot control; quality of cotton-seed from plants killed at different dates by root rot; selection of cotton strains resistant to root rot; studies on cotton wilt disease; chemical control of root knot (*Heterodera marioni*), *Fusarium lycopersici*, damping-off organisms, and southern blight (*Sclerotium rolfsii*).

505. COTTON ROOT ROT ORGANISM: SURVIVAL. By W. N. Ezekiel. (*Proc. Assoc. Sthrn. Agr. Wkrs.*, 1939, **40**, p. 185. From *Summ. Curr. Lit.*, xx., **18**, 1940, p. 400.) The effect of "girdling" cotton plants on the survival of the root rot organism, *Phymatotrichum omnivorum*, is reported. Plants girdled on July 29 suffered heavy casualties, but the roots were free from the viable organism three to eight weeks after girdling. Girdling on September 3 did not affect the appearance of the foliage, but had no effect on the viability of the root rot organisms.

506. PRELIMINARY SEROLOGICAL STUDIES OF *Phymatotrichum omnivorum*. By R. W. Cumley and G. W. Goldsmith. (*Phytopathology*, xxx., **2**, 1940, p. 130. From *Rev. App. Mycol.*, xix., **6**, 1940, p. 343.) In order to determine the systematic affinities of the cotton root rot fungus, *Phymatotrichum omnivorum*, a preliminary serological study was undertaken at the University of Texas, involving two methods of securing material. In the first, young sporophores of *Tyromyces palustris*, *Psalliota sylvatica*, *Clitocybe illudens*, *Lycoperdon gemmatum*, *Calvatia cyathiformis*, *Secotium acuminatum*, and *Ustilago maydis* (*U. zeæ*) were collected in the field, washed, dried over sulphuric acid at 50° C., and stored in glass jars at 5°. In the second, pure cultures of *Rhizopus nigricans*, *Aspergillus niger*, *Penicillium luteum*, *Hormodendrum cladosporioides*, *Fusarium* sp. of the *Elegans* sections, *Sclerotium rolsfii*, and *Phymatotrichum omnivorum* were grown in a liquid nutrient (non-protein) medium, removed when sufficiently developed, washed, dried in an incubator at 40 to 45°, and stored at 5°. The results (which are discussed and tabulated) of precipitin and complement fixation tests with rabbit sera prepared against *P. omnivorum* indicated a closer relationship between *P. omnivorum* and the puffballs, *L. gemmatum*, *Secotium acuminatum*, and *C. cyathiformis*, than with any of the other genera, thereby supporting Presley and Thom's conjecture as to the taxonomic position of the root rot pathogen among the Gasteromycetes.

[Cf. Abstr. **137**, Vol. XV. of this Review.]

507. CONIDIAL GERMINATION OF THE COTTON ROOT ROT FUNGUS. By E. O. Roberts. (*Bull. Torrey. Bot. Cl.*, lxxvii., **1**, 1940, p. 77. From *Rev. App. Mycol.*, xix., **5**, 1940, p. 275.) In germination tests with conidia of the cotton root rot fungus, *Phymatotrichum omnivorum*, conducted in Texas, maximum germination, which never exceeded 5 per cent., occurred in conidia stored for three days or more at 5° C. previous to the test and then (after treatment with mercuric chloride solution) incubated at 30° in darkness for three days on the following media: egg albumen, potato dextrose, and Weindling's agars; potato dextrose and manure decoction broth, and potato dextrose agar plus either yeast extract or manure. Germ tubes frequently reached a length of 34 μ , their average duration being three days. The low percentage of germination obtained is attributed in part to the treatment with mercuric chloride. Spores stored at room temperature for several months and failing to germinate developed germ tubes after subsequent storage at 5°, indicating that dormancy rather than non-viability may account for the failure of the spores to germinate. Other incubation conditions and media tested showed reduced or no germination. It is suggested that the failure of the germinated conidia to continue development may be explained by the assumption that the fungus is heterothallic, and that cultures so far tried contain but one of the necessary plus and minus strains.

508. DISTRIBUTION AND PREVALENCE OF OZONIUM ROOT ROT IN THE SHELTER-BELT PLANTING AREA OF OKLAHOMA. By G. L. Peltier *et al.* (*Phytopathology*, xxix., **6**, 1939, p. 485. From *Rev. App. Mycol.*, xviii., **10**, 1939, p. 674.) Using the methods described by the senior author for the determination of the distribution and prevalence of root rot (*Phymatotrichum omnivorum*) in the shelter-belt zone of Texas, the writers conducted a detailed survey of part of a

similar planting area in south-western Oklahoma, and here discuss their progress up to August, 1938. A sharp line of demarcation between infested and non-infested areas was a feature of the surveys in both States, possibly associated with temperature and soil factors. For instance, the northward extension of the rot to the foothills of the Wichita Mountains, Oklahoma, may be attributed to the protection afforded by these ranges from cold north winds. A correlation was further observed between types of natural vegetation and the incidence of *P. omnivorum*. Another outstanding characteristic of root rot is its tendency to accumulate from the headwaters of a creek down the drainage basin, as in Deep Red Creek, Oklahoma. The futility of clearing native infested areas for diversified farming has become obvious in both States. It is evident that surveys for root rot should be made before replanting shelter-belts, so that infested areas can be avoided or planted to resistant crops.

509. ALKALOIDS FROM *Sanguinaria canadensis* AND THEIR INFLUENCE ON GROWTH OF *Phymatotrichum omnivorum*. By G. A. Greathouse. (*Pl. Physiol.*, **14**, 2, 1939, p. 377. From *Exp. Sta. Rec.*, **81**, 5, 1939, p. 657.) Sanguinarine, chelerythrine, and protopine were isolated from the roots and rhizomes of *S. canadensis*, and the first was shown experimentally to prevent the growth of *P. omnivorum* at 2.5 p.p.m., while the other two alkaloids proved less toxic. The evidence presented is believed to indicate that alkaloids play an important rôle in the resistance of *S. canadensis* to *Phymatotrichum* root rot.

510. LA STENOSIS: UN ACHICIAMIENTO Y ARRUGAMIENTO DEL ALGODÓN. By R. O. Botero. (*Publ. Min. Econ. Nac. Colombia*, 1940. From *Rev. App. Mycol.*, xix., **7**, 1940, p. 404.) Information is presented on the occurrence of cotton stenosis in Colombia, where the UA-83 variety appears to be the most resistant. The Malvaceæ *Sida acuta* and *S. salicifolia*, both of common occurrence in the vicinity of affected plantings, show malformations of a similar type to those observed on cotton and may be hosts of the same pathogenic agent.

511. PLANT VIRUSES AND VIRUS DISEASES. By F. C. Bawden. (The Chronica Botanica Co., Leiden, Holland, 1939. From *Rev. App. Mycol.*, xviii., **2**, 1939, p. 756.) In the author's preface it is stated that: "This is not . . . a textbook of virus diseases. Detailed descriptions of symptoms and host ranges are not given, but all other aspects of the subject are treated." Following a brief historical introduction, two chapters are devoted to symptomatology, one to transmission and properties of viruses in expressed sap, and another to a discussion of the mechanism of insect transmission and the relationship between viruses and their vectors. Chapter VI deals with variation and acquired immunity. After a concise summary of serology in relation to plant viruses, three chapters are assigned to topics with which the author has been intimately concerned—viz., the purification of viruses and their chemical, physical, and optical properties. Methods of determining the sizes of virus particles are indicated and the evidence leading to the conclusion that the nucleo-proteins are the viruses themselves is critically discussed. The physiology of virus-diseased plants has been allotted one chapter. After notes on classification and control measures, the book concludes with a discussion on the origin and multiplication of viruses. There is an adequate index. This book, which provides a valuable summary of a large and scattered literature, should be accessible to all those interested in plant viruses.

512. INVESTIGATIONS ON THE MECHANISM OF THE TRANSMISSION OF PLANT VIRUSES BY INSECT VECTORS. III. THE INSECT'S SALIVA. By H. H. Storey. (*Proc. Roy. Soc., B*, **127**, 849, 1939, p. 526. From *Rev. App. Ent.*, xxviii., Ser. A, **6**, 1940, p. 300.) A continuation of previous investigations. In the present paper observations were carried out on the excretion of saliva by *Cicadulina*

mbila, Naude, and attempts were made to demonstrate experimentally in this saliva the virus of streak disease of maize, of which the insect is a specific vector.

[Cf. Abstrs. 254, Vol. XI., and 710, Vol. XV. of this Review.]

513. LE WILT DU COTONNIER. By A. Brixhe. (*Bull. Com. Coton. Congolais*, iv., 15, 1939, p. 79. From *Rev. App. Mycol.*, xix., 5, 1940, p. 275.) This is a summary of the writer's observations in the United States on American methods of combating the *Fusarium* wilt of cotton (*F. vasinfectum*), with a view to their application in the Belgian Congo, where the presence of the disease has recently been established.

[Cf. Abstr. 245, Vol. XVII., June Abstract Number of Review, 1940.]

514. THE EFFECTS OF NITROGEN SOURCE, NITROGEN LEVEL, AND RELATIVE ACIDITY ON *FUSARIUM* WILT OF COTTON. By W. H. Tharp and C. H. Wadleigh. (*Proc. Ass. Sth. Agr. Wkrs.*, xl, 1939, p. 190. From *Rev. App. Mycol.*, xix., 7, 1940, p. 403.) In greenhouse sand-nutrient experiments a highly significant increase in cotton wilt (*Fusarium vasinfectum*) was associated with heavy applications of nitrate, and an even greater one with similar doses of ammonia. Susceptible plants supplied with the high nitrate solution at pH 8 were less severely diseased than at either 6 or 4, whereas the opposite was the case with ammonia.

515. FERTILIZERS IN RELATION TO INCIDENCE OF WILT AS AFFECTING A RESISTANT AND A SUSCEPTIBLE VARIETY (OF COTTON). By J. B. Dick. (*Proc. Ass. Sth. Agr. Wkrs.*, xl, 1939, p. 68. From *Rev. App. Mycol.*, xix., 7, 1940, p. 403.) The incidence of wilt (*Fusarium vasinfectum*) reached a maximum, with a correspondingly reduced cotton yield, in the absence of potash, increasing amounts of which diminished the amount of infection, but when applied in excess (600 lb. 6-8-16 fertilizer per acre) greatly lowered yields in the resistant cotton variety, while not appreciably affecting those of the susceptible one. Nitrogen and potash, singly or in certain combinations, effectively reduced wilt and augmented yields, whereas phosphate, especially in the absence of nitrogen and potash, increased the incidence of infection.

516. DEPARTAMENTO DE GENÉTICA VEGETAL. MEMORIA DE LA SECCIÓN GENÉTICA DE ALGODÓN (VALLE DE LIMA). By T. B. Barducci. (*Mem. Estac. Exp. Agr. Soc. Nac. Agr.*, Lima, 11a, 1939, p. 285. From *Rev. App. Mycol.*, xix., 4, 1940, p. 212.) One of the chief problems engaging the attention of cotton geneticists in Peru is the development of selections of the Tanguis variety combining resistance to wilt (*Verticillium* sp.) with desirable commercial characters. Outstanding from this point of view is the line Cñ-LM7-35. Some degree of tolerance has also been shown by Giza 7, introduced from Egypt in 1935, and to a lesser extent by Sakellaridis, Pima, S × P (1938-39), Sea Island, Semiáspero and Riñón, in contrast to the susceptible representatives of the Upland group cultivated locally—viz., Mars Rose, Coker-Wilds, Miller, Dixie 14-5, Dixie Triumph, Delfos, and Acala. Under local conditions in the Lima Valley the incidence of infection in stands from September-sown seed was shown by counts at thirty-day intervals during the growing seasons from 1935 to 1938 to increase most rapidly during January (from 30 to 80 per cent.), slower rises taking place in February and March (up to 90 or 95 per cent.), while the total in May reached 98 per cent. Data are adduced pointing to the inadvisability of unduly early sowing—e.g., in July, when the low soil temperature (mean of 17.5° C.) checks the normal growth of the seedlings and exposes them to ready infection by *V. sp.*, favourable conditions for the development of which extend from August onwards. Other preventive measures should include judicious crop rotation; delayed irrigation to secure vigorous root development; dense stands

to maintain regular and uniform soil humidity; use of superior first-year seed; and thorough tillage of the soil, with strict attention to all practices tending to promote a strong root system, the avoidance of any injury to which is likewise of the first importance.

517. TOXICITY OF SELENIUM-CONTAINING PLANTS TO PESTS. (*Nature*, cxlv., 3672, 1940, p. 430. From *Trop. Agr.*, xvii., 6, 1940, p. 120.) Among papers read before the annual meeting of the American Association for the Advancement of Science, which took place at Columbus, Ohio, at the end of December last, are two on the above subject. V. H. Morris, C. R. Neiswander and J. D. Sayre discussed a method of rendering corn plants resistant to red spider attacks by growing them in nutrient solution to which was added each week 1 p.p.m. of sodium selenate. When the rate of selenium application was increased to 2 or 3 p.p.m. no red spiders were found to survive. Under such conditions the growth and normal nutrition of the plants were unaffected. Similar results have been obtained in additional tests with a number of other species of plants. In the second communication Messrs. Neiswander and Morris described results of experiments indicating that an accumulation of 90 to 100 parts per million of selenium in the tissues of certain plants was sufficient to prevent infestation by *Tetranychus telarius*, and that a lesser amount controlled the chrysanthemum aphid, *Macrosiphoniella sanborni*. The investigation suggests a possible method for controlling pests of ornamental plants.

518. SEED TREATMENTS FOR COTTON. By K. Starr Chester. (*Oklahoma Exp. Sta. Circ. No.* 89, 1940.) Describes two treatments of cotton seed to control diseases, (a) by dusting with ceresan; (b) by delinting with concentrated sulphuric acid or hydrochloric acid gas.

519. COTTON SEEDS: DISINFECTION. By G. Russo. (*Boll. Coton.*, 34, 1939, p. 661. From *Summ. Curr. Lit.*, xx., 11, 1940, p. 259.) An account is given of investigations of the efficiency of sulphuric acid, hydrocyanic acid, carbon disulphide, and warm water as disinfectants for cotton seeds infested with larvæ of *Platyedra gossypiella*. The larvæ are found in cavities in the seeds, the entrances to which are protected by a thick silky tissue. Commercial sulphuric acid of 66° B. does not penetrate the protective tissue when allowed to act for periods of five to sixty minutes, but kills the larvæ when it can obtain access through other damaged parts of the seeds, or when the larvæ are in the free state. Disinfection with hydrocyanic acid or with carbon disulphide under ordinary atmospheric conditions is effective if the seeds are arranged in thin layers. For the treatment of large masses these disinfectants should be applied in a rarefied atmosphere. Treatment in warm water and dry heat treatment give good results. Sulphuric acid and hydrocyanic acid treatments stimulate germination.

520. COTTON-SEED TREATMENT. By J. R. Haskell and H. D. Barker. (*Leaflet U.S. Dpt. Agr.* 198, 1940. From *Rev. App. Mycol.*, xix., 7, 1940, p. 404.) This is a popular note on the control of seed-borne diseases of cotton, with special reference to anthracnose (*Glomerella gossypii*), by seed treatment with 2 per cent. ceresan (3 oz. per bush.) or new improved ceresan (1½ oz.). The cost of the two preparations is estimated at 9½ to 14 cents for ceresan and 5 to 7 for new improved, and the outlay per acre, at a sowing rate of 5 pecks, at 12 to 24 cents (inclusive of labour). The North Carolina Extension Service estimated that the average net profit per acre from seed disinfection on 43 farms in 1936 was \$13.05 and on 100 in 1937 \$11.27. In that State disinfectant treatment was practised over some 600,000 acres in 1939 as compared with 2,000, 7,000, 24,000, 200,000, and 450,000 in 1934, 1935, 1936, 1937, and 1938 respectively. Directions are given for the construction of a home-made treating machine from a rotating barrel or oil-drum mixer, while for large-scale use satisfactory power-driven automatic appliances, capable of handling up to 60 100-lb. sacks per hour, are available on the market.

GENERAL BOTANY, BREEDING, ETC.

521. RECENT PROGRESS IN PLANT BREEDING. By E. B. Babcock. (*Sci. Mon. N.Y.*, 1939, p. 393. From *Pl. Bre. Abs.*, x., **4**, 1940, p. 272.) This brief general review covers the utilization of hybrid vigour, breeding for disease resistance, the artificial induction of polyploidy, and methods of speeding up plant breeding, such as the use of vernalization and growing embryos in nutrient media.

522. A TEXTBOOK OF GENERAL BOTANY FOR COLLEGES AND UNIVERSITIES. By R. M. Holman and W. W. Robbins. (John Wiley and Sons, N.Y.; Chapman and Hall, London, 1938. From *Exp. Sta. Rec.*, **80**, 3, 1939, p. 314.) Among major changes made in this, the fourth edition, the sections on absorption and conduction by roots have been completely rewritten, as have also the sections dealing with the rise of sap in stems and the conduction of foods. The theory of active solute absorption has been given greater weight than in previous editions, the revised classification of tissues emphasizes progressive and regressive development, and a discussion of hormones in their relation to growth phenomena has been included. "In addition to the major changes mentioned above, there are scores of smaller ones which in many cases correct errors or make the meaning more understandable."

523. GROWING PLANTS WITHOUT SOIL. By E. A. Helgeson. (*N. Dakota Sta. Bimo. Bull.* 1, 1938, **2**, p. 10. From *Exp. Sta. Rec.*, **80**, 6, 1939, p. 746.) This is a general discussion of sand and water culture technique with special reference to its commercial possibilities. Nutrient formulas are given, and brief notes are included on acidity and minor elements, the cost of the solutions, yields to be expected, and water culture work at the station.

524. THE BIOLOGY OF CROSSING-OVER. By C. D. Darlington. (*Proc. 25th Ind. Sci. Congr.* Part III. Calcutta, 1938. Sect. Bot., p. 141. From *Pl. Bre. Abs.*, ix., **4**, 1939, p. 375.) The mechanism of crossing-over in relation to meiosis is discussed. Crossing-over, besides being an indispensable condition of meiosis, produces certain incidental effects which are of evolutionary significance. It simply recombines the parts of the chromosomes or genes without changing their arrangements, or produces secondary structural alterations in already changed chromosomes of structural and numerical hybrids. The author considers it probable that secondary structural change is an integral part of the mechanism of variation in all sexually reproducing organisms.

525. HOW PLANTS HAVE FOUND THEIR HOMES—I, II. By J. C. Willis. (*J. Roy. Hort. Soc.*, **64**, 1939, pp. 259, 299. From *Pl. Bre. Abs.*, x., **2**, 1940, p. 72.) This is a discussion of the evolution and geographical distribution of plants in which it is shown that the mechanism of gradual adaptational change under the influence of natural selection, as envisaged by Darwin, is quite inadequate to explain the facts. The mutation theory and the age and area hypothesis are discussed.

526. HORMONES AND THE ANALYSIS OF GROWTH. By H. V. Thimann. (*Pl. Phys.*, **13**, 1938, 3, p. 437. From *Exp. Sta. Rec.*, **80**, 4, 1939, p. 462.) In this address before the American Association for the Advancement of Science the author presents a constructive review of recent work, including his own findings, on the physiology of growth substances in relation to the mechanism of acceleration, inhibition, and correlation of growth phenomena in plants. He stresses two points—viz.: (1) that the problem is one of plant physiology, not pharmacology, since "we do not . . . simply apply all kinds of substances externally to plants, but we are engaged in the study of processes which go on in the normal plant" and (2) that the question is not purely academic. For example, "one immediate result of the work has been . . . the elucidation of the action of auxins in causing root formation on cuttings, a finding of immediate practical utility."

527. PLANT BREEDING PROBLEMS IN INDIA. By R. Ramiah. (*Planters Gaz.*, Calcutta, April-May, 1940, p. 15.) A general discussion of methods of breeding and improvement in breeding technique, deterioration of strains, limits of selection, application of genetics and cytology to plant breeding, etc. The author recommends the carrying-out of more extensive trials with new crop strains in every tract on a well-thought-out plan; improvement in the prevalent technique of selection in hybrid material; study of the genetical variance in quantitative characters; and the collection of a wide range of material for utilization in breeding.

528. ALGUMAS QUESTÕES TÉCNICAS SÓBRE A BIOLOGIA E FISILOGIA DO ALGODOEIRO. By I. Chavirin. (*Ouro Branco*, December, 1939, Brazil. From *Cotton Lit.*, Washington, D.C., x., 5, 1940, p. 239.) Some technical questions on the biology and physiology of cotton.

529. AN INTRODUCTION TO MODERN GENETICS. By C. H. Waddington. (George Allen and Unwin Ltd., London, 1939, 18s. From *Pl. Bre. Abs.*, ix., 3, 1939, p. 360.) It is probably true that most textbooks on genetics have been too rigidly confined to what the present author calls "formal genetics"—the discussion of Mendel's laws and the corresponding phenomena of chromosome behaviour, and genetic analysis in general. This book is of particular interest in that the author has not taken this narrow view; there are, among others, very interesting sections on the action of the gene on development, on evolutionary mechanisms and the nature of the genetic differences between taxonomic entities, on human genetics and eugenics, and on the chemical nature of chromosome and gene. There is also a brief chapter on plant and animal breeding. All this does not mean that the more ordinary aspects of genetics have been neglected; they are, in fact, dealt with in a very interesting manner, with the facts well arranged and lucidly expressed. The book contains an adequate index and a bibliography in which the policy has been to indicate review articles rather than original sources. It is singularly free from mistakes. The book may be regarded as an outstandingly good survey of the present state of genetical science.

530. GENES: ATOMS OF HEREDITY. By B. P. Pal. (*Ind. Farmg.*, 1, 6, June, 1940, p. 270.) A brief general paper on the subject of genetics, in which the work of Mendel is discussed.

531. GENETICS IN RELATION TO EVOLUTION AND SYSTEMATICS AT THE SEVENTH INTERNATIONAL GENETICAL CONGRESS, EDINBURGH, 1939. By W. B. Turrill. (*Kew Bull.*, 9, 1939, p. 500. From *Pl. Bre. Abs.*, x., 2, 1940, p. 71.) This paper contains summaries of the papers read at the Plenary Session of the above section of the congress and a list of other communications read to the section. The papers summarized include one by S. C. Harland on "Genetical Studies in the Genus *Gossypium* and their Relation to Evolutionary and Taxonomic Problems."

532. MEMOIRS OF THE COTTON RESEARCH STATION, TRINIDAD. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d.) The sixteenth number of Series A, Genetics, has recently been published, and contains the following papers reprinted from the *Journal of Genetics*:

(a) **THE GENETIC INTERPRETATION OF PLANT BREEDING PROBLEMS.** By J. B. Hutchinson. These two papers are the first of a series which is to deal with the application of genetics to plant breeding. Hutchinson describes the object of his paper as being to survey the application of genetic theory to cotton breeding in particular and to outline the problems in which the geneticist should be able to help the breeder. In discussing variability and the choice of material for selection, the author states that recent work on crop populations has shown that natural selection results in the establishment of a population consisting of a great range of types. The breeder's ideal must consequently be reconsidered,

and selection for uniformity should not proceed beyond the stage needed to ensure a satisfactory grade in the marketable product, except where it is possible by further specialization to achieve closer adaptation to local climates. The records of breeding projects with Sea Island cotton show that in practice it is impossible to achieve genetic uniformity; purity may therefore be regarded as a secondary consideration. Reference is made to the studies of Vavilov and others on the distribution of variability, and the importance is stressed of maintaining indigenous variability wherever this occurs. The paper examines the possibility of improving the efficiency of selection. Variation is of two kinds, environmental and genetic, and selection will be most efficient when the ratio of the genetic component to the total variance is at a maximum. The advantages and shortcomings of progeny row breeding are mentioned, and the question whether "secondary" selection (selection in the immediate progeny of single plants) has been over-emphasized at the expense of "primary" selection (simple plant selection in unselected populations, hybrid material and improved bulks from earlier selections). In discussing the problems that confront the plant breeder Hutchinson mentions the synthesis of yield in different circumstances and in different strains. For this study the development of discriminant functions provides a useful tool. At present there is some knowledge of what characters can most easily be influenced by selection, but nothing is known of the extent to which a change in one character will result in compensating changes which may perhaps be less easily detected in others. He concludes by laying emphasis on the fact that in attempting to study problems whose solutions will be helpful to the plant breeder, the geneticist will find that the stimulus of practical needs will open up lines of enquiry of wide theoretical interest.

(b) THE INHERITANCE OF QUANTITATIVE CHARACTERS AND PLANT BREEDING. By V. G. Panse. The object of the second paper is to summarize the results obtained in a statistical study of quantitative inheritance relating to F_2 and F_3 progenies. The genetic and plant-breeding aspects of the results are emphasized. The experimental data used refer to the staple-length measurements on F_2 and F_3 progenies of crosses between strains of cotton belonging to the species *G. arboreum* var. *neglectum*, grown at the Institute of Plant Industry, Indore, Central India. The regression of mean staple length of F_3 progenies on F_2 phenotypic values shows that it is advantageous to consider plot values and select individuals on the basis of their excess over the former where, as in the present case, interplot variation affects the character in addition to intraplot variation. The coefficient of regression also gives an estimate of the genetic fraction of the total F_2 variance. This is an important relationship, as it affords a basis for separating the inheritable and non-inheritable components of variance in the experimental material. The ratio of the square of the genotypic variance within F_3 progenies to the variance of this variance is shown to represent the "effective" number of factors which can account for the segregation in F_2 and which hypothetically possess equal variance and are without linkage. With a given F_2 variance and a given effective number of factors it is possible to set up different genetic systems or models consisting of factors varying in magnitude and number and with or without dominance. Five models with the smallest possible number of factors or an infinite number, and each with or without dominance, are considered. By the use of a moment-generating function in three variables the moments of the distribution of the F_2 phenotype and of certain related quantities are calculated for each system. With these it is possible to express in terms of the F_2 phenotype properties of the F_3 progenies such as the genotypic mean of variance, and further to calculate their mean values in a proportion of the F_3 population resulting from a selected proportion of F_2 phenotypes. Similar mean values obtained from experimental data can be compared with these theoretical values

in order to discover the presence or absence of dominance and to decide on the possible number of factors operating in the experimental material. In the present case, assuming a 10 per cent. selection in F_2 , theoretical mean values for (1) the genotypic mean and (2) variance of F_3 progenies, (3) the covariance between the two, and (4) the variance of F_3 means, and (5) of F_3 variances are calculated for each model. Their usefulness for identifying the genetic situation and the information obtained from them on the effect of selection applied and on questions relating to further selection are discussed.

533. SOME PROBLEMS IN APPLIED GENETICS. By J. B. Hutchinson. (*Chron. Bot.*, **5**, 1939, p. 403. From *Pl. Bre. Abs.*, x., **2**, 1940, p. 126.) In breeding cotton, selection is at first the most effective method, and replicated progeny row testing is a valuable aid. As the variability of the populations decreases, selection becomes ineffective and hybridization must be resorted to. Inter-family crosses are often of great use in restoring variability, especially if careful records have been kept of the relationship of different lines derived from the same original source. For wider crosses, studies of varietal and specific differences can be a valuable aid. A study of varietal mixtures may lead to valuable information on the causes of degeneration in pure strains. In introducing new types—e.g., American cottons to India or Africa—a highly variable stock should be imported and grown for a long time to allow acclimatization to take place.

534. WILD PERUVIAN COTTON: GENETICS. By T. Boza-Barducci and R. M. Madoo. (*Nature*, **145**, 1940, p. 553. From *Summ. Curr. Lit.*, xx., **9**, 1940, p. 222.) A study of the meiotic chromosome conjugation of the wild Peruvian cotton *G. Raimondii*, Ulb., and of a cross with *G. hirsutum* suggests that the species is more closely related to *G. armourianum*, *G. trilobum*, *G. Harknessii* and *G. aridum* than (as Hutchinson has proposed) to *G. Davidsonii* and *G. klotzschianum*, although it resembles these morphologically.

[Cf. Abstr. 271, Vol. XVII. of this Review.]

535. THE GENETIC FRONT IN THE U.S.S.R. By J. W. Pincus. (*J. Hered.*, **31**, 1940, p. 165. From *Pl. Bre. Abs.*, x., **3**, 1940, p. 181.) An account of the recent genetic controversy between the more conventional geneticists in the U.S.S.R. and those who discount the theories of Mendel, Morgan and Johannsen and believe that the influence of environment is paramount. Most of the paper consists of translations of summaries from Russian journals.

536. CHROMOSOME STRUCTURE: A CRITICAL REVIEW. By Y. Kuwada. (*Cytologia*, **10**, 1939, Tokyo. From *Pl. Bre. Abs.*, x., **2**, 1940, p. 90.) A useful review of the subject, in which special reference is made to the problems of spiralization in chromosomes. There is an extensive bibliography. A more general review of the same subject is referred to in the following abstract.

537. CHROMOSOME STRUCTURE. By B. R. Nebel. (*Bot. Rev.*, **5**, 1939, p. 563. From *Pl. Bre. Abs.*, x., **2**, 1940, p. 90.) An extensive review of the problems of chromosome structure, with a bibliography of some 300 references. A more detailed consideration of spiralization in chromosomes is given in the review referred to in the above abstract.

538. NOTE SUR L'EXPERIMENTATION COTONNIERE. By R. Pittery and M. Engelbeen. (*Rpt. Ann. pour l'Exer.*, 1938, Part 2. Publ. Inst. Agr. Congo Belge, 1939: Hors Sér., p. 129. From *Pl. Bre. Abs.*, x., **3**, 1940, p. 212.) The statistical basis of trials and experiments with cotton is explained for the instruction of those wishing to conduct experiments.

539. GROWING COTTON BOLL: INTERNAL TEMPERATURE. By D. B. Anderson. (*Amer. J. Bot.*, **27**, 1940, p. 43. From *Summ. Curr. Lit.*, xx., **17**, 1940, p. 445.) The temperature at the centre of full-sized unripe bolls exposed to full sunshine

was regularly about 6 to 8° C. above that of the atmosphere. Every passing cloud caused a drop in temperature which was often greater at the centre of the boll than in the air. High and low points in the temperature curves occurred at nearly the same times. Bolls growing in the shade differed much less from the air in temperature and were less responsive to changes. At night bolls exposed to a clear sky were very slightly colder than the air, but shaded bolls were very slightly warmer.

540. A HISTÓRIA DA EVOLUÇÃO DOS ALGODÕES CULTIVADOS DO NOVO MUNDO. By S. C. Harland. (Pubd. Min. de Agr. Rio de Janeiro, 1938. From *Cott. Lit.*, April, 1940, p. 181.) A history of the evolution of the cultivated cottons of the New World.

541. REGISTRATION OF IMPROVED COTTON VARIETIES—II. By H. B. Brown. (*J. Amer. Soc. Agr.*, **32**, 1940, p. 83. From *Pl. Bre. Abs.*, x., **2**, 1940, p. 125.) One new variety, Texacala, was approved for registration and is described. It is a selection of Acala previously known as Rogers Acala III and was made by J. H. McDonald. It is very uniform, gives excellent yields, especially under slightly arid conditions, has a staple length of 1 $\frac{1}{3}$ to 1 $\frac{1}{8}$ inches, with a lint percentage of 34 to 38, and is somewhat earlier than other Texas big boll varieties. [Cf. Abstr. 527, Vol. XIV. of this Review.]

542. THE ORIGIN OF AMERICAN TETRAPLOID *Gossypium* SPECIES. By J. O. Beasley. (*Amer. Nat.*, **74**, 1940, p. 285. From *Pl. Bre. Abs.*, x., **4**, 1940, p. 292.) An artificial allotetraploid cotton, which is highly fertile but usually male sterile, has been produced by doubling the chromosome number in hybrids of *G. therberi* Tod. (\equiv *G. Thurberi*, an American 13-chromosome species) \times *G. arboreum* var. *neglectum*, Hutchinson and Ghose (an Asiatic 13-chromosome species). Hybrids are easily obtained by crossing the synthesized tetraploid as female parent with the American 26-chromosome allotetraploid species. The hybrid *therberi* \times *arboreum* forms less than 6 bivalents at meiosis and anaphase bridges are common. The synthesized tetraploid usually forms 26 bivalents and the hybrid between the synthesized tetraploid and natural tetraploids forms 24 to 25 bivalents plus 4-2 univalents. The hybrids between the two tetraploids set seeds when self-pollinated and also in reciprocal crosses with the natural tetraploid. These facts suggest that the American 26-chromosome cottons are allotetraploids, one parent being similar to American 13-chromosome species and the other to Asiatic 13-chromosome species.

543. HYBRIDIZATION OF AMERICAN 26-CHROMOSOME AND ASIATIC 13-CHROMOSOME SPECIES OF *GOSSYPIMUM*. By J. O. Beasley. (*J. Agr. Res.*, lx., **3**, 1940, p. 175.) In reciprocal crosses of American 26-chromosome \times Asiatic 13-chromosome cottons, the pollen germinates and pollen tubes enter more than half the embryo sacs. Embryo and endosperm development is initiated, but soon becomes aberrant. By using the American 26-chromosome type as female and a few grains of pollen from a 26-chromosome type along with an excess of Asiatic 13-chromosome pollen, it is possible to produce minute hybrid seeds. Plants can be produced from the seeds by germinating them on sterile culture media. Hybrids involving six combinations of American 26-chromosome \times Asiatic 13-chromosome cottons were produced. This dependable method of producing hybrids between American and Asiatic cottons will be useful in producing numerous hybrids from which polyploids can be produced.

544. STUDIES ON THE ONTOGENESIS AND CHEMICAL STRUCTURE OF THE VEGETABLE (COTTON) CELL WALL. By K. Hess *et al.* (*Naturwissenschaften*, **27**, **37**, 1939, p. 622. In German. From *Cott. Lit.*, April, 1940, p. 180.) "A review of development and structure of cotton fibres, differences between the phases of length growth and thickness growth, the change of cellulose from

unordered form to regular mol. arrangement as found by X-ray and the presence of waxy material in the young fibre. The qualities of the primary and secondary wall materials are compared in some detail. Whereas in the primary stage (length growth) waxes, phosphatides, protein, etc., are formed in the walls, the second stage is primarily one of formation of cellulose lattice. The primary cellulose, present in small amounts, is not in lattice form owing to the presence of the admixtures; removal of the latter spontaneously causes change to lattice form (X-ray, double refraction, swelling and viscosity evidence)."

545. THE INFLUENCE OF VARYING CATION PROPORTIONS UPON THE GROWTH OF YOUNG COTTON PLANTS. By C. H. Wadleigh. (*Soil Sci.*, **48**, 2, 1939, p. 109. From *Exp. Sta. Rec.*, **82**, 3, 1940, p. 312.) Cotton was grown in nutrient solutions varying in proportions of K, Ca, Mg, and Fe, but in very dilute concentration, only cations entering into the variability and the proportions being calculated on the equivalence basis. Growth proved directly related to the level of K supply, while increasing the F^{+++} supply had a distinctly adverse effect on it. The influence of Ca^{++} and Mg^{++} was not so pronounced as that of the other two cations, but tended to be beneficial unless they supplied a preponderance of the total variable cations. The pH changes in the substrate were inversely related to the K : Fe ratio—viz., the higher this ratio the less change in H^{+} in the solution. It was suggested that at the higher levels of Fe^{+++} a larger proportion of cations absorbed, in relation to a given amount of anion absorption, is H^{+} . Some of the theoretical implications of the results are discussed.

546. EFFECTS OF INBREEDING COTTON, WITH SPECIAL REFERENCE TO STAPLE LENGTH AND LINT PERCENTAGE. By L. M. Humphrey. (*Bull. No. 387, Agr. Exp. Sta., Univ. of Arkansas*, 1940.) At the Arkansas Agricultural Experiment Station in 1936 three varieties were selected for inbreeding—D. and P.L. 11A, Rowden, and Acala. In 1937 the programme was expanded to include five more varieties—Lone Star 2124, Delfos 9252, Stoneville 2B, Stoneville 4A, and Stoneville 5A; and in 1938 Rowden 456-19 and Santa Lola were added. Varieties were found to be very non-uniform, particularly for fibre characteristics. A highly significant negative correlation between staple length and lint percentage was found in Acala, Delfos 9252, and the three Stoneville cottons, but no significant correlation was found in the remaining varieties. Inbreeding cotton varieties rapidly segregates many types that become relatively uniform after two to three generations, the inbred lines being much more uniform in all cases than the varieties from which they arose. Comparison of two- and seven-year inbreds indicates that there is little increase in uniformity after two years of inbreeding.

547. INTERSPECIFIC HYBRIDIZATION BETWEEN ASIATIC AND NEW WORLD COTTONS. By K. C. Amin. (*Ind. J. Agr. Sci.*, x., **3**, 1940, p. 404.) Summarizes the general position of interspecific hybridization in cottons, with references to the literature, and gives details of work carried out at Surat from 1932-38. In all, 23 F_1 hybrids between Asiatic and New World cottons were grown. Backcrossing to New World cottons proved successful, and twenty-seven first backcrosses were obtained, many showing fertility through second backcrossing and selfing. Data regarding the percentage success in hybridization, hybrid boll characters, general characters of the hybrids, including sterility and fertility, are discussed.

548. HYBRID INDIAN COTTONS: INHERITANCE OF STAPLE LENGTH; STATISTICAL STUDY. By V. G. Panse. (*Anns. Eugenics*, **10**, 1940, p. 76. From *J. Text. Inst.*, xxxi., **8**, 1940, A467.) This paper discusses the statistical methods used in a study of the inheritance of staple length in crosses between strains of Indian cotton. The results of the study will be published elsewhere.

549. S×P COTTON IN COMPARISON WITH PIMA. By T. H. Kearney *et al.* (*Circ. No. 550*, Washington, D.C., 1940.) The purpose of this paper is to set

forth the characteristics of the S×P variety of American-Egyptian cotton in comparison with those of the older Pima variety. Particular consideration is given to the comparative yields of the two varieties and to the factors involved in productiveness, as these are the features of most interest to cotton growers.

In respect to yield, S×P cotton is shown by comparative tests to be superior to Pima. The new variety possesses an advantage over Pima amounting, on the average, to approximately 5 per cent. in yield of seed cotton, and about 13 per cent. in production of lint. The favourable differential in gin outturn or lint percentage is a decided advantage of the S×P variety, for the extra lint gained in this way adds nothing to the cost of production. The higher lint percentage is accounted for by greater abundance of lint on S×P seeds, not by smaller or lighter seeds. The results of a small number of comparisons indicate that a larger proportion of the total crop usually is included in the first picking of S×P, as compared with Pima. This substantiates a belief held by growers that S×P is the earlier variety. Bolls of S×P appear to be more wasteful than Pima, a characteristic that is disadvantageous at times when pickers are scarce. On the other hand, S×P bolls contain appreciably larger quantities of cotton and are more easily picked. S×P seed cotton can be ginned approximately 20 per cent. faster than Pima. The lint of S×P is shorter but more uniform in length, and is lighter coloured than that of Pima. The results of six comparative spinning tests of S×P and Pima cottons showed that the yarns made from S×P had a greater breaking strength, for all counts from 10 to 120, than the corresponding yarns made from Pima, with a single exception, in which there was no difference between the varieties. In all other instances the S×P yarns were from 2.4 to 5.4 per cent. stronger than the Pima yarns, notwithstanding the greater staple length of the latter cotton. In nearly every sample the S×P yarns were smoother and of better appearance than the Pima yarns.

550. O INDICE DE OLEO NAS SELEÇÕES DO ALGODÃO. (THE OIL INDEX IN COTTON SELECTIONS.) By H. TAVARES. (*Bul. Sec. Agr.*, **4**, Pernambuco, 1939, p. 168. From *Pl. Bre. Abs.*, x., **2**, 1940, p. 126.) The "oil index" is calculated by adding the percentage of kernel to the percentage oil content of the kernel. This index was found to be correlated positively with kernel percentage and weight of one boll, but not with size of seed, lint length or lint index. A slight negative correlation existed between the oil index and lint percentage, and a certain negative correlation was evident between kernel percentage and lint percentage, though the figures were not significant. It is concluded, therefore, that by selecting seeds with thin seed coats—consequently a high kernel percentage—it should be possible to raise the oil content without prejudice to the lint.

551. A STUDY OF THE INHERITANCE OF LOCULAR COMPOSITION IN MYSORE-AMERICAN COTTON FRUIT AND ITS RELATION TO YIELD. By V. N. RANGANATHA RAO. (*J. Mysore Agr. Exp. Union*, **18**, 1940, p. 1. From *Pl. Bre. Abs.*, x., **3**, 1940, p. 172.) By selection from the cross *Gossypium hirsutum* (local Doddahatti) × *G. peruvianum*, two strains of Mysore-American cotton with a very high percentage of 5-lock bolls were developed. The results clearly indicate that loculus number in cotton is heritable. It was shown that the amount of seed cotton per loculus is not significantly different in 4-lock and 5-lock bolls, the 5-lock boll therefore yielding considerably more cotton per boll.

552. A NOTE ON THE RELATION OF *Gossypium raimondii* ULB. TO OTHER AMERICAN SPECIES. By H. B. NEWCOMBE. (*J. Hered.*, **30**, 1939, p. 530. From *Pl. Bre. Abs.*, x., **3**, 1940, p. 213.) A brief note on the taxonomic relationships of the 13-chromosome cotton species,

553. USE OF A CHEMICAL IN PLANT BREEDING. (*Sci. Suppl.* 90, 1939, No. 2328, p. 8. From *Pl. Bre. Abs.*, x., 2, 1940, p. 93.) Some of the work being carried out with colchicine in the United States is summarized. It is stated that J. O. Beasley in North Carolina is attempting to obtain homozygous lines from crosses between Sea Island and Upland cottons by doubling the chromosome number (using colchicine) of a haploid plant derived from a twin seed of the hybrid. The aim is to obtain a type combining the long fibre of Sea Island with the early maturity of Upland cotton.

554. CYTOGENETIC RESULTS WITH COLCHICINE. By M. L. Ruttle and B. R. Nebel. (N.Y. State Exp. Sta. *Biol. Zentbl.*, 59, 1-2, 1939. From *Exp. Sta. Rec.*, 81, 2, 1939, p. 189.) This is a review and progress report presenting data illustrative of the present status of a breeding programme carried out by the senior author to demonstrate that colchicine is practically important to plant breeders willing to use cytogenetic methods. There are fourteen literature references.

555. OBSERVATIONS ON THE IMMEDIATE EFFECTS OF COLCHICINE. By J. G. O'Mara. (*J. Hered.*, 30, 2, 1939, p. 35. From *Exp. Sta. Rec.*, 81, 2, 1939, p. 189.) "Observations on the effects of colchicine treatments for different periods and concentrations are recorded. The hypertrophy usually associated with treatment was found not to involve the meristem, but the region of elongation. The colchicine-affected chromosomes are more accurately measurable than ordinary somatic chromosomes; this may indicate that the drug can be profitably used in studies of chromosome morphology in somatic tissues."

556. A PRELIMINARY NOTE ON INTERSPECIFIC HYBRIDIZATION AND USE OF COLCHICINE IN COTTON. By K. C. Amin. (*Curr. Sci.*, 9, 1940, p. 74. From *Pl. Bre. Abs.*, x., 3, 1940, p. 171.) Back-crosses of hybrids between New World and Old World cultivated cottons to the New World parents have been obtained, though the seed set on the F_1 plants was very small. The back-crosses may be sterile, of intermediate fertility, or completely fertile. Their progeny show marked fertility in some cases and a predominance of New World characters. Colchicine treatment has been applied to a number of cotton species and hybrids. The plants of *G. herbaceum*, *G. arboreum* and *G. hirsutum* with the doubled chromosome number were sterile, showing very defective bursting of the anthers. Fertile types resulted from treatment of the sterile hybrids *G. arboreum* \times *G. anomalum*, *G. Davidsonii* \times *G. anomalum* and *G. hirsutum* \times *G. herbaceum*.

557. A COLCHICINE-INDUCED AMPHIDIPLOID: UPLAND \times EGYPTIAN COTTON (*Gossypium hirsutum* L. \times *G. barbadense* L.). By A. S. Kasparyan. (*C. R. [Doklady] Acad. Sci., U.S.S.R.*, 26, 1940, p. 163. From *Pl. Bre. Abs.*, x., 3, 1940, p. 214.) Chromosome doubling was successfully induced in F_1 *G. hirsutum* \times *G. barbadense* by colchicine treatment. The amphidiploid plants were late in flowering and few flowers were obtained. Very few good pollen grains were formed, but they were uniform and large in size. Some seeds were set. The amphidiploid plants showed the usual morphological characteristics of polyploids.

558. MASS PRODUCTION OF AMPHIDIPLOIDS BY COLCHICINE TREATMENT IN COTTON. By A. R. Zhebrak and M. M. Rzaev. (*C. R. [Doklady] Acad. Sci., U.S.S.R.*, 26, 1940, p. 159. From *Pl. Bre. Abs.*, x., 3, 1940, p. 213.) Amphidiploid plants or amphidiploid sectors were produced by colchicine treatment of the seeds or shoot apices in the following *Gossypium* crosses: *G. hirsutum* \times *G. Sturtii*, *G. hirsutum* \times *G. armourianum*, *G. herbaceum* \times *G. anomalum*, *G. hirsutum* \times *G. barbadense*, *G. hirsutum* \times *G. arboreum* and *G. hirsutum* \times *G. Stocksii*. The usual inverse relationship between the fertility of the F_1 and of the amphidiploid was observed.

559. THE PRODUCTION OF POLYPLOIDS IN *Gossypium*. By J. O. Beasley. (*J. Hered.*, **31**, 1940, p. 39. From *Pl. Bre. Abs.*, x., **3**, 1940, p. 213.) A wide range of polyploids was produced in *Gossypium* by immersing apical meristems in 0.2 per cent. colchicine solution for twenty-four hours, and a single example was also obtained by low temperature treatment. Autotetraploid *G. herbaceum* showed typical *gigas* characters, but was male-sterile. Autotetraploids of *G. hirsutum* and *G. barbadense* were also normally male-sterile, though there are sometimes a few viable pollen grains. Tetraploids from *G. herbaceum* and from *G. hirsutum* \times *G. arboreum* var. *neglectum*, two closely related cultivated Asiatic species, had a low percentage of apparently viable pollen. Hexaploids from *G. hirsutum* \times *G. herbaceum* and from *G. hirsutum* \times *G. arboreum* var. *neglectum* were fertile, with 65 and 85 per cent. respectively of normal pollen. The flowers of these types were longer than in the corresponding triploids. There were fewer seeds than in the better Upland varieties. The fibre length of the *hirsutum-herbaceum* hexaploid was 29 mm. as compared with 27 mm. and 20 mm. for the parents. In growth and flowering habit the hexaploids resembled Upland cottons. *G. barbadense* \times *G. herbaceum* hexaploids had only 30 per cent. of good pollen. Hexaploids from the cross *G. hirsutum* \times *G. harknessii* (a wild 13-chromosome American species) had about 80 per cent. of good pollen and had light brown lint less dense and slightly shorter than in *G. hirsutum*. Hexaploids from *G. hirsutum* \times *G. sturtii* (a wild Australian diploid) had 85 per cent. of good pollen. Many of the *G. sturtii* characters were dominant. The fibres were slightly shorter than those of the American parent. Octoploids obtained from *G. hirsutum* \times *G. barbadense* variety Pima had anthers that usually failed to dehisce. They showed the hybrid vigour of the tetraploid F_1 , the leaves, however, were wrinkled and coarser, with a darker green colour and larger epidermal hairs. Fibre length averaged 41 mm. as compared with 35 mm. for the F_1 , 22 mm. for *G. hirsutum* and 41 mm. for Pima. Octoploids involving the Sea Island variety Bleak Hall instead of Pima had a larger number of dehiscing anthers. Tetraploids from *G. arboreum* var. *neglectum* \times *G. thurberi* rarely had viable pollen, but had high ovule fertility when crossed with 26-chromosome American pollen. In addition, pure lines of *G. hirsutum* and *G. barbadense* were obtained by doubling the chromosome number in haploids. The fertility relations of many of the above polyploids when crossed to the parent or other species are recorded, and the possibility of using polyploids in practical breeding briefly discussed.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

560. THE FUTURE OF TECHNICAL TRAINING AND THE COTTON INDUSTRY. By J. Read. (*J. Text. Inst.*, xxxi., **4**, 1940, p. 47.) Stresses the need for closer co-operation between the cotton industry and the technical colleges in order to maintain efficient technical control of the industry by supplying the necessary trained personnel for spinning and weaving under present conditions of working. Another side of the industry which needs special attention is the training as fabric experts of salesmen and representatives for home and overseas markets in order to increase the volume of trade.

561. PHYSICAL CHARACTERISTICS IN COTTON AND THEIR INTER-RELATIONSHIP. By M. A. Grimes. (*Texas Sta. Rpt.*, 1938, p. 100. From *Exp. Sta. Rec.*, **82**, **4**, 1940, p. 572.) Summarizes data on the percentage of mature fibres, the weight per inch, and the breaking strength of the fibres of Lightning Express and Half-and-Half varieties of cotton, the back-cross, and the F_1 and F_2 generations.

562. COTTON CELLULOSE: DEGRADATION BY HEAT. By H. Staudinger and I. Jurisch. (*Papier Fabrikant*, **37**, 1939, p. 181. From *J. Text. Inst.*, xxx., **8**,

1939, A557.) The degree of polymerization is recorded of cotton after heating in the air or a high vacuum at 85, 105, 125, 140 and 150° C. for four days or 150° C. for two or six days. Extensive degradation sets in at about 120° C.

563. FLUIDITY OF COTTON IN DIMETHYL DIBENZYL AMMONIUM HYDROXIDE: MEASURE OF COTTON DEGRADATION. By W. W. Russell and N. T. Woodberry. (*Indus. and Eng. Chem.*, March, 1940. From *Cott. Lit.*, April, 1940, p. 214.) The different samples of bleached cotton cellulose examined were found to dissolve readily in dimethyl dibenzyl ammonium hydroxide (commercially known as Triton F), to produce solutions whose fluidities (or viscosities) are a measure of the extent to which the cellulose has been modified. For the celluloses studied the Triton fluidities are very nearly a tenth, and the Triton specific viscosities very nearly twice the corresponding cuprammonium hydroxide values. The Triton method is simpler and more rapidly carried out than standard cuprammonium methods.

564. CELLULOSE ORIENTATION, STRENGTH, AND CELL WALL DEVELOPMENT OF COTTON FIBRES. By E. E. Berkley. (*Text. Res.*, 9, 10, 1939, p. 355. From *Exp. Sta. Rec.*, 82, 4, 1940, p. 478.) The X-ray studies and determinations of tensile strength and percentage of thin-walled fibres, made largely on Mexican Big Boll cotton grown at the North Carolina Experiment Station in 1937, provided data indicating that the proportion of ordinary thin-walled fibres which usually occur in commercial cottons will not affect the application of the X-ray method for the purpose of strength estimation or prediction.

565. COTTON CELLULOSE: FRACTIONATION BY CUPRAMMONIUM SOLUTION. By A. A. Morozov. (*Colloid J.*, U.S.S.R., 6, 1939, p. 691. From *Summ. Curr. Lit.*, xx., 15, 1940, p. 389.) Scoured cotton was left in cuprammonium solvent diluted with various amounts of water, and the solution injected through copper gauze into dilute acetic acid, thus giving a series of insoluble fractions (trapped by the gauze) and "soluble" fractions (those regenerated by the acid). The latter had higher viscosities in cuprammonium than the former, but the difference and the magnitudes of the viscosities decreased with the amount of water added to the solvent.

566. THE PROPERTIES OF THE OXYCELLULOSES FORMED IN THE EARLY STAGES OF THE OXIDATION OF COTTON CELLULOSE BY PERIODIC ACID AND METAPERIODATE. By G. F. Davidson. (*J. Text. Inst.*, xxxi., 7, July, 1940, T81.) In a preliminary note it has been reported that periodic acid oxycelluloses belong to the extreme reducing type of oxycellulose and exhibit this property of alkali-sensitivity in a high degree. The present paper gives a detailed account of the results on which these conclusions are based, including a description of the properties of products obtained by the oxidation of cotton linters and yarn with periodic acid and potassium metaperiodate, and a comparison with typical modified celluloses previously studied. The properties considered are: the copper number, the absorption of methylene blue; the fluidity in cuprammonium solution (called the "cellulose fluidity"); the fluidity in acetone solution of the nitrocellulose derived from the modified cellulose by a standardized procedure (called the "nitrocellulose fluidity"); and, in the case of chemically modified yarns, the single-thread breaking load.

[Cf. Abstr. 145, Vol. XVI. of this Review.]

567. STUDIES ON THE DEVELOPMENT OF COTTON FIBRE. I. RELATION OF DEVELOPMENT OF CRUDE COTTON FIBRE TO THE OTHER PRINCIPAL BOLL CONSTITUENTS. By J. Compton and F. E. Haver. (*Boyce Thompson Inst. Contrib.* 11(2). January-March, 1940. New York. From *Cott. Lit.*, x., 6, 1940, p. 315.) "Other than the slower rate of maturation and higher moisture content of the fibrous greenhouse material, no essential difference seems to

exist between the ratios of the wet crude fibre constituents of bolls grown under field and greenhouse conditions. During the period of active fibre development the ratio, dry crude fibre : reducing sugars : waxes, on a constant-moisture basis, varies as follows: as the dry crude fibre mass increases the reducing sugars decrease, whereas the extractable fats and waxes remain practically constant."

568. COTTON FIBRE: STRUCTURE. By F. L. Barrows. (*Contrib. Boyce Thompson Inst.*, **11**, 1940, p. 161. From *Summ. Curr. Lit.*, xx., **15**, 1940, p. 381.) The author summarizes published work on the dimensions of the cotton hair and evidence for the existence of lamellæ in the wall, and reports new measurements on cross-sections of hairs of *G. hirsutum* (var. Super Seven) taken at intervals from four days onwards from living bolls grown under continuous illumination and under normal conditions. The special feature of the technique employed (which is fully described) is that the material did not dry out at any stage. Dimensions of the hair, lumen and wall are tabulated, with observed numbers of lamellæ and calculated lamella width, and two sets of photomicrographs are reproduced. The evidence is that cellulose particles are laid down in successive lamellæ of remarkably uniform thickness, about 1 μ , whether the cotton is grown under continuous illumination or naturally. There is great variability in wall thickness among hairs on the same seed, and the number of lamellæ is larger at the base of the older hairs than at the tips. The lamellæ cannot be reconciled by the author with Balls's "daily growth rings." X-ray diffraction patterns show only slight differences in orientation and amount of cellulose between hair-growth in daylight and in continuous light.

569. COTTON FIBRE PECTIC SUBSTANCE: COMPOSITION AND RELATION TO FIBRE PROPERTIES. By R. L. Whistler *et al.* (*Text. Res.*, **10**, 1940, p. 269. From *Summ. Curr. Lit.*, xx., **13**, 1940, p. 328.) The authors have applied their method of uronic acid determination in the presence of carbohydrates (study of the rate of evolution of carbon dioxide on boiling the material with 12 per cent. hydrochloric acid) to an investigation of the composition and location of pectic substances in cotton fibre. The conclusion is drawn that pectic substances are present as an insoluble salt of metals such as Ca, Mg, and Fe, and that it can be removed by conversion into a soluble salt of Na or NH_4 without weakening the fibre or altering its fluidity in cuprammonium or its copper number. Such treatments are (1) boiling the solvent-extracted cotton with 1 per cent. caustic soda for two hours, (2) extraction with 0.5 per cent. ammonium oxalate at 75 to 80° C. for sixteen hours, or (3) electrodialysis followed by steeping in 2 per cent. ammonia solution at 0 to 30° C. for fifteen hours. On the other hand, treatment with acids does not greatly reduce the content of pectic matter, but causes tendering and increased fluidity and copper number. The evidence is held to be a strong argument against the view that pectic substances are combined with cellulose in cotton or form the cementing material that binds the fibrils together and confers strength and high viscosity. This is supported by further evidence as to (a) the virtual identity of the pectic matter removed in methods (2) and (3) above, (b) the pectic nature of material from solvent-extracted cotton that does not dissolve in cuprammonium, and (c) that the addition of pectic matter from cotton, fruit pectin, or pectic acid does not modify the fluidity of a solution of cellulose in cuprammonium.

570. COTTON FIBRES: BEHAVIOUR IN CUPRAMMONIUM HYDROXIDE SOLUTIONS. By C. W. Hock and M. Harris. (*Amer. Dyes. Rpt.*, **29**, 1940, p. 287. From *Summ. Curr. Lit.*, xx., **15**, 1940, p. 381.) An account is given of investigations of the microscopically observable changes occurring in cotton fibres on treatment with cuprammonium hydroxide solutions. The cellulose dissolves and leaves

residues which vary in amount and structure according to the degree of purification of the fibres. The undissolved residue from raw and from dewaxed fibres consists principally of fragmented shells which formed the outer surface of the fibres, and to a less extent of material from the lumen. Both of these residues are isotropic and stain deeply with ruthenium red. Fibres from which both wax and pectic substance have been removed leave only a very small amount of an isotropic residue which exhibits no definite cytological structure. When a steady flow of cuprammonium hydroxide solution is applied to fibres mounted on a slide, the initial swelling is followed by the appearance of small ellipsoidal particles which range from 1 to 2 μ in size, appear bright between crossed nicols, and stain dark with iodine and sulphuric acid. Identical particles appear, however, when cuprammonium hydroxide solution is drawn under the cover-glass in the absence of fibres. These particles, which result from the exposure of the cuprammonium hydroxide reagent to the air, are washed under the cover-glass, where they become intimately associated with the fibre residue. Formation of these particles may be prevented by using a specially constructed cell which prevents exposure of the reagent. Under these conditions no particles were observed during the slow passage, even for prolonged periods, of the cuprammonium reagent over cotton fibres. These results are compared with those of other investigators, particularly those of Miss Farr.

[Cf. Abstr. 333, Vol. XVI. of this Review.]

571. COTTON FIBRE: STRUCTURE. By H. R. Mauersberger. (*Rayon Text. Mnthly.*, 21, 1940, p. 413. From *Summ. Curr. Lit.*, xx., 16, 1940, p. 412.) An advance note (provided by Miss Farr and her associates) is given of a forthcoming reply to recent criticisms by Harris and his colleagues of the view that cell membranes consist of minute cellulose particles embedded in a "pectic" medium. Photomicrographs are reproduced of cotton cellulose particles (a) treated with cuprammonium, (b) swollen in 72 per cent. sulphuric acid, and (c) stained with iodine, side by side with corresponding pictures of the granular formations resulting from the exposure of cuprammonium to the air. The latter are seen to dissolve in sulphuric acid and to develop diamond-shaped crystals with iodine.

572. COTTON FIBRE: X-RAY STRUCTURE AND STRENGTH AT DIFFERENT STAGES OF GROWTH. By E. E. Berkley. (*Text. Res.*, 9, 1939, p. 355. From *Summ. Curr. Lit.*, xix., 23, 1939, p. 687.) In connection with the X-ray method for estimating the strength of cotton fibres the author reports observations on the effects of thin-walled fibres and the arrangement of the cellulose and so-called waxes of the primary wall. The samples used were mostly young or immature fibres from unopened bolls of known age from four different series of samples of Mexican Big Boll cotton and one each from Hopi and Sea Island. The X-ray samples were prepared by immersion of the bolls in boiling water or alkali and the fibres paralleled by combing under a stream of water on a glass plate. The diffraction patterns were then obtained from bundles of cotton fibres about 1 mm. diameter with copper $K\alpha$ radiation. Measurements of the 002 rings of the X-ray diffraction patterns of the fibres containing primary wall only showed a tendency for preferred orientation of the b -axis of the unit cell. Microscopic studies under polarized light also showed that the cellulose of the primary wall lies transverse to the fibre axis. As the secondary wall was laid down, the 002 ring became equally dark throughout, and with continued deposition of cellulose the region of greatest darkening of the ring shifted 90 degrees from that of the primary wall. No random orientation of cellulose was observed. The wax pattern was more prominent than the cellulose pattern during the stage when the cell contained only the primary wall, but the cellulose pattern of the primary wall and the wax pattern both disappeared within four to six days after secondary

thickening was initiated. The secondary wall pattern changed gradually with cellulose deposition for the first few days, showing a more or less progressive improvement of the orientation of the successive layers of cellulose in relation to the fibre axis. Little or no improvement in the orientation was observed after about the sixth day. The tensile strength of the fibre as measured by the improved Chandler bundle method increased for twelve to eighteen days after secondary thickening was initiated, and reached its maximum at about the thirty-fifth day after the flowers opened, or three or four weeks before the bolls opened. There are indications that the proportion of ordinary thin-walled fibres, which usually occurs in commercial cottons, will not affect the application of the X-ray method of strength determination.

573. EFFECT OF NATURAL ADMIXTURES IN CELLULOSE ON THE DRYING PROPERTIES OF COTTON FIBRE. By P. P. Viktorov *et al.* (*Zhur. Prikl. Khimii*, **12**, Moscow, 1939. From *Cott. Lit.*, April, 1940, pp. 215, 216.) (In Russian.) Part II. The content of pectic substances in cotton fibre. III. Removal of pectic substances from cotton by fermenting, and the effect of this treatment on the adsorption properties of fibre. IV. The effect of removal of nitrogen-containing substances of cotton on its adsorptive properties.

574. COTTON FIBRES: EFFECT OF LENGTH ON SPINNING QUALITY. By R. P. Richardson. (*Text. Digest* [Qtrly. J. Text. Assoc. India], i., **1**, 1940, p. 7. From *J. Text. Inst.*, August, 1940, A428.) Some comments are offered on the influence of fibre length (and fineness) on the behaviour of cotton in the various roller drafting zones. It is argued that the benefit of long staple as a contribution to yarn strength is due to the larger number of fibres per cross-section (giving greater surface of contact) and the better array of the fibres in drafting.

575. FIBRE MOUNTING MEDIUM SECTION CUTTING. By J. M. Preston. (*J. Text. Inst.*, xxxi., August, 1940, T206.) The improved medium for mounting fibres for section cutting by the "modified plate method" consists of approximately equal volumes of melted glycerine jelly and liquid Indian ink. (*Cf. Abstr.* **149**, Vol. XIV. of this Review.)

576. LINTERS: PRODUCTION. By M. Pilette. (*Bull. Trimes. Com. Coton. Congolais*, v., **16**, 1940, p. 14. From *Summ. Curr. Lit.*, xx., **12**, 1940, p. 287.) A useful account is given of the production of linters, based on observations made in the United States. A large section drawing is included of a typical delinting machine and a flow-sheet of a modern plant. Factors that influence the output are discussed with the help of graphs, and a special chapter is devoted to an account of the "gumming" and "filing" operations involved in sharpening the saws. The output of the recognized seven grades of linters in the United States, 1938-39 season, is recorded.

577. BIANCAVILLA COTTON: CHARACTERISTICS. By R. Riso. (*Boll. Coton.*, **35**, 1940, p. 71. From *Summ. Curr. Lit.*, xx., **13**, 1940, p. 328.) The selection of cotton for mixing with staple fibre and cottonized hemp is discussed, and it is pointed out that in the spinning of such mixtures the cotton is required to function as a guide and to promote cohesion, and that it should be regular in length, fine, and with good elastic properties and a high number of convolutions and crimps. The Sicilian cotton "Biancavilla" is claimed to satisfy these requirements, and length, strength, extensibility and other data are given. This cotton compares favourably with a Middling $\frac{1}{8}$ inch cotton. It has a staple length of 24 to 25.5 mm., a high regularity in length, a fineness comparable with that of Egyptian cotton, a breaking length generally higher than that of Middling American cotton, normal extensibility, a high number of convolutions (60 to 70 in 10 mm.), and marked crimps.

578. NEPS: CAUSES AND PREVENTION. By J. L'Hiver. (*Rev. Text.*, **38**, 1940, p. 75. From *Summ. Curr. Lit.*, **xx.**, **12**, 1940, p. 289.) The influence of methods and conditions of cultivation, picking, and ginning on the presence of neps in raw cotton is briefly discussed, and causes and methods of preventing neps formation in scutching and carding processes are described. The importance of efficient stripping and grinding and correct setting of the cards is emphasized, and some general rules are given.

579. COTTON: STAPLING TEST. By E. H. Helliwell. (*Cotton, U.S.*, **104**, **2**, 1940, p. 106. From *J. Text. Inst.*, May, 1940, A264.) The author cites some experiences to show the advantage of preparing a staple diagram ("fibre array") over accepting the nominal grader's length. He shows in a small illustration a sorting device that "lays down fibres in order of their length," transmits the outline of the array to a paper roll, divides the diagram thus obtained into equal 5 per cent. divisions, and marks a point 30 per cent. of the way along the base line from the long-fibre end. The height of the diagram at this point gives the "average fibre length." According to the author, nominal "one inch" cotton of the U.S. Government standard has an average length of 0.86 inch and other samples classed as inch cotton by competent graders ranged from 0.80 to 0.92 inch. The breaking load of his warp yarn fluctuated according to the "average fibre length."

580. THE STAPLE LENGTH OF RAW COTTON: VARIOUS CONCEPTIONS AND A NEW METHOD OF INVESTIGATION. By O. Roehrich. (*Coton et Cult. Cotonn.*, **13**, 1939, p. 1.) The determination of effective length by the "pulling" method of the United States Dept. of Agriculture is discussed, and it is pointed out that the operation eliminates the longest and the shortest fibres. The official definition of length (Washington length) based on this pulling method is quoted, and American and Havre standard types are compared. The Shirley Institute method of determining effective length, percentage of short fibre and percentage dispersion from Baer diagrams is briefly described. A method of preparing Baer diagrams which involves weighing the sorted groups of fibres is described, and characteristic curves showing the percentage weights of each comb group are given for American and Havre types. The correspondences between the two sets of types are discussed. A simple method of determining effective or commercial length from Baer diagrams obtained by the weighing method is explained. The author's method (*E.C.G. Rev.*, vi., 1929, p. 202) of measuring homogeneity from the Baer diagram in terms of homogeneity of "flatness" (*palier*) (ratio of height of the trace at 50 per cent. along the base line to that of 10 per cent.) and general homogeneity (length at 70 per cent./that at 5 per cent.) are outlined and a new simple method of expressing homogeneity in terms of percentages of useful fibres and short fibres is explained. A line from the mid-point of the height of the diagram at 5 per cent. from the long end is run parallel to the base until it meets the trace. The length of this line gives the "percentage of utilizable fibre." Tables are given showing effective length, arithmetic mean, and homogeneity data for American and Havre classes. It is pointed out that the effective lengths determined by the method described agree well with the official lengths. Arithmetic means are of little significance. The influence of length on spinning quality is discussed and Peirce's "standard weight" and "intrinsic fineness" (*E.C.G.C.*, 3rd Cott. Conf., 1938, p. 157) are criticized. A method of calculating the count to which a cotton can be spun, which takes into consideration both fineness and length, is explained. Formulæ are given, together with results obtained for different types of cotton.

581. COTTON STAPLING DEVICE. By B. Johnson. (*Arkansas Sta. Bull.* **381**, 1939. From *Summ. Curr. Lit.*, **xx.**, **14**, 1940, p. 353.) The construction and

operation of a mechanical comber for seed cotton and a simple measurement of the length of the combed fibre are described. The latter involves the use of the author's photoelectric device, which sorts the fibres on one seed or a composite sample of as many as eight seeds.

[Cf. Abstr. 143, Vol. XVI. of this Review.]

582. RECENT TENDENCIES IN COTTON SPINNING. By C. B. (*Text. Manufr.*, July and August, 1940, pp. 267 and 301.) Critical consideration of some important recent suggestions for improvement or economy in cotton spinning processes.

583. SPINNING PROBLEMS: DISCUSSION. Southern Textile Assn. (E. Carolina Divn.). (*Cotton, U.S.*, 104, 5, 1940. From *J. Text. Inst.*, xxxi., 7, July, 1940, A369.) The following topics are discussed: Spinning of loose-dyed cotton; experiences with oiling of cotton, the advantage of applying oil in the blending hopper being stressed; high draft roving; relative merits of light and heavy spindle tapes.

584. TEXTILE TECHNOLOGY: RESEARCH PROBLEMS. By E. R. Schwarz. (*Mech. Eng.*, 62, 1940, p. 361. From *Summ. Curr. Lit.*, xx., 12, 1940, p. 314.) A report of a lecture to engineers in which parallels are drawn between research problems in engineering and textile technology. The main headings are: Research in the Field of Fibre Structure; Similarity of Structural and Textile Studies; X-ray Examination of Fibre Structure; Stresses imposed by Manufacturing Processes; Heat-Resisting and Insulating Qualities of Fabrics; Permeability Testing of Fabrics; Importance of Resilience in Textiles; Effect of Alternate Stresses on Fibres; Combination of Molecular Elements in Synthetic Fibres.

585. A STROBOSCOPE FOR THE TEXTILE INDUSTRY. (*Text. Wkly.*, 31/4/40, p. 644.) A description of the new model made by the General Radio Co. of Cambridge, Mass., U.S.A.

586. COTTON YARNS: DIAMETER MEASUREMENTS. By E. H. Helliwell. (*Text. Wld.*, 90, 4, 1940, p. 60. From *Summ. Curr. Lit.*, xx., 11, 1940, p. 274.) A table is given showing the diameters of singles cotton yarns, ranging from 12's to 90's, as determined by cross-section area, microscopic and micrometer measurements, and by the Ashenhurst formula. Reasons for the differences between the results obtained by the different methods are discussed. Cross-section area measurements and microscopic measurements are more accurate than micrometer measurements. The Ashenhurst formula, $1/(0.92 \sqrt{N \times 840})$, gives results that are comparable with both cross-section area measurements and microscopic measurements. Indicated diameters of many-plyed yarns bear little relation to the diameter of the singles yarns before plying. The twist inserted in yarn affects its indicated diameter. Moisture regain affects yarn diameter, but to a less degree than it affects yarn count and in a different manner. A yarn which is bone dry will have a larger diameter than the same yarn at 7 per cent. regain, but a weft yarn conditioned almost to saturation will have a larger diameter than the same yarn at 7 per cent. regain.

587. NOMOGRAMS: APPLICATION. By L. Shapiro. (*Amer. Dyes. Rpt.*, 29, 1940, p. 97. From *J. Text. Inst.*, May, 1940, A273.) Nomograms for the interconversion of temperature scales, barometric units, and English and metric units of length, volume, and weight are given, and their use is briefly explained.

588. SHIRLEY INSTITUTE FADING TEST EQUIPMENT. By H. Hunter. (*J. Soc. Dyers and Col.*, 56, 1940, p. 64. From *Summ. Curr. Lit.*, xx., 7, 1940, p. 163.) The optical and technical problems to be solved in the establishment of an accelerated light-fastness test are stated, and particulars are given of the equipment at the Shirley Institute, including a high-density arc and means to

supply filtered, humidified air to the targets carrying the specimens. The mean intensity of light on the samples is about 200,000 foot candles, or about twenty times that of noon summer sunlight. A fastness classification (classes 1-8) is used in which the exposures for "just perceptible change" are less than 1, 1, 2, 4, 8, 16 and 32 hours.

589. THE EXAMINATION OF DAMAGED COTTON BY THE CONGO RED TEST: FURTHER DEVELOPMENTS AND APPLICATIONS. By G. G. Clegg. (*J. Text. Inst.*, May, 1940, T49.) Results are given of further observations on the appearance of damaged and treated cotton fibres stained by the Congo red method. In damaged fibres swollen with caustic soda solution Congo red dye stains the exposed secondary cellulose a bright red, but the cuticle only a faint pink. Observations on fibres that have been bleached, heat tendered, etc., show that these treatments result in a gradual breakdown of the cuticle into spirals that are coarse with mild treatments, but become finer with increasing severity of treatment until finally no spiral structure is visible and the fibre stains uniformly red. In addition to the slow cuticle spirals there are two quick spirals resulting from heat, chemical or fungal tendering after preliminary swelling in 9 per cent. caustic soda. It would appear that these quick spirals were originally connected with the collapsed convolution of the fibre and follow the fibrillæ of the secondary cellulose. When experience has been gained it will be possible to recognize mechanical damage, heat tendering, singed ends, over-bleaching, and acid, light, mildew, or bacterial tendering. The Congo red test can also be used in (a) determination of the number of abnormally thickened fibres; (b) examination of "dead" cotton; (c) detection of mechanical damage due to processing; (d) examination of yarn breaks; (e) determination of the amount of bleached stock in a yarn; (f) examination of the wear of finished goods. Specific examples are included of the application of the test to the examination of defects in cotton goods.

590. ELECTRICAL RESISTANCE TYPE MOISTURE CONTENT DETERMINATION APPARATUS. British Cott. Indus. Res. Assn. and E. H. Jones. (B.P. 516,379 of 24/6/39, 1/1/40. From *Summ. Curr. Lit.*, xx., 4, 1940, p. 80.) In a method of estimating the moisture content of samples of material such as cotton, paper and the like by measuring the electrical resistance between electrodes pressed in or on the material, use is made of a triode valve and an electric circuit derived from a divided potential in such a manner that the grid of the valve is given a negative bias, which has a value dependent on the values of the resistance between the electrodes and auxiliary standard resistances, and which never falls below a certain minimum, the circuit including a current-measuring instrument which affords a measure of the anode current. An electrode member for carrying out this method consists of metal electrodes separated by insulating material, the member being finished so as to present to the material a smooth surface so small that a readily attainable degree of pressure suffices to give a resistance sensibly independent of the precise shape and size of the sample. The electrode member may consist of two wires wound on or embedded in a plate of insulating material to form a double helix. Alternatively, the electrode member may consist of two flat metal plates separated by a block of insulating material which may have the form of a blunted wedge. Another form of electrode member consists of a central metallic rod and concentric sheet of metal conformably shaped in cross-section, the two being separated by insulating material. The electrode member fits into a holder which is provided with two concentric conducting sleeves fixed in an insulating mounting, which are connected to the inner lead and outer covering of an armoured cable which serves to establish connection with electrical circuit. A press is provided for establishing electrical connection between samples of material and electrode members.

591. COTTON: ACIDIC PROPERTIES AND CATION EXCHANGE. By A. M. Sookne and M. Harris. (*Amer. Dyes. Rpt.*, 1940, **29**, pp. 357, 383. From *Summ. Curr. Lit.*, **xx.**, **17**, 1940, p. 440.) An account is given of an investigation of the fixation of hydrochloric acid by cotton, and its dependence on the concentration of the acid and on the ash content of the fibre. The materials examined were: (1) "dewaxed cotton"—i.e., cotton extracted with hot alcohol for twenty-four hours and then washed with distilled water; (2) "depectinized cotton"—i.e., extracted cotton that was boiled with 1 per cent. caustic soda and washed with dilute acetic acid, as for the preparation of "standard cellulose"; (3) "lime-washed depectinized cotton," in which any acid liberated by the acid wash in (2) was fixed by steeping the cotton in lime water. The acid-binding capacity of the cotton was determined by titration with bromocresol purple as indicator. The glass electrode with a cathode-ray "eye" as null indicator was used for pH measurements, and the H-ion equivalence of the cationic ash was measured by electrodialysis. One experiment was conducted at +25.02° C., all the others at +0.01° C. In order to allow for the possible selective adsorption of water from the acid solutions, substances that were not likely to be fixed by cotton were added in parallel tests and the change in their concentrations determined; sodium chloride (determined by evaporation) and trehalose (polarimeter) were used. The correction for adsorption of water was considerable at pH's below 1.5 but negligible above 2.4. The effect of adding a neutral salt (0.1 and 1.0 *M* potassium chloride) on the equilibrium between cotton and acid was also investigated. The results for the dewaxed and lime-washed depectinized cottons at pH 1.08 to 6.38 are tabulated and plotted as graphs of bound acid pH. They show that the maximum acid-binding capacity (0.066 milli-equivalent per gm. for dewaxed cotton and 0.008 milli-equivalent for lime-washed depectinized cotton) occurs at about pH 1 and is equivalent to the cationic ash—that is, the acid bound at any acidity depends on the ash content. Most of the acidic groups of cotton are obviously contributed by the pectic substance, and if it is assumed that the remainder are present as an integral part of the cellulose molecule (? end group) the results indicate a M.W. of about 100,000, or a minimum of 600 glucose units. The Donnan equilibrium is applied to the titration curves of the pectic substance.

592. COTTON YARN: QUALITY; FACTORS AND TESTING. By R. P. Richardson. (*Ind. Text. J.*, **50**, 1940, p. 254. From *Summ. Curr. Lit.*, **xx.**, **17**, 1940, p. 441.) A report of a lecture on modern knowledge of the relationships between fibre characteristics and yarn quality and how quality is influenced by blending, combing, twisting and sizing. Some indication of the performance of a warp yarn in the loom is given by a test in which a pendent group of threads (12 or 30 inches long) is loaded by weights and the extension under load and the residual extension after release are observed. Typical figures are tabulated for a 30's yarn under loads of 3.7, 5.0 and 6.2 oz. per thread.

593. ÜBER MAKROMOLEKULARE VERBINDUNGEN. MITTEILUNG. ÜBER DIE ZERSTÖRUNG DER CELLULOSE DURCH MIKROORGANISMEN. By H. Staudinger *et al.* (*Zellwolle, Kunst., Seide* 45 [1], Berlin, January, 1940. From *Summ. Curr. Lit.*, **xx.**, **6**, 1940, p. 141.) Tests on cotton yarn showed that a loss in strength occurred when the yarn was exposed to the action of cellulose-destroying bacteria by immersion in water. Determinations of the degree of polymerization of the cellulose of the original treated samples and of a used fishing net, and also of nitrated products obtained from them, showed that the decrease in strength was not due to any appreciable decrease in degree of polymerization. Photomicrographs of the fibres show a corrosion effect as a result of attack by bacteria. The injured fibres do not give the usual bead effect on swelling in cuprammonium. Photomicrographs of cotton, ramie, staple fibre and Cuprama fibres after

immersion in sump water are given and compared. It is suggested that the decomposition of cellulose by bacteria proceeds from the end groups of the molecule, whereas attack of cellulose by fungi results in a splitting of the molecule in the middle.

594. COTTON: MOISTURE CONTENT. By R. Riso. (*Boll. Cotton.*, **35**, 1940, p. 117. From *Summ. Curr. Lit.*, xx., **15**, 1940, p. 380.) The importance of moisture in the buying and selling of textile materials is pointed out, the need for specifying whether the percentage moisture is reckoned on the actual weight or the absolute dry weight of the material is emphasized, and moisture regain is discussed. The relations between invoiced net weight, checked net weight, absolute dry weight and commercial weight of cotton, and a graphical method of determining dry weight and commercial weight of a sample as percentages of the checked net weight, and the commercial weight of a delivery as a percentage of the invoiced weight, are illustrated by the study of a numerical example.

595. COTTON-SEED TESTS: PERMEABILITY. By J. G. Brown. (*Proc. Assoc. Sthrn. Agr. Wkrs.*, 1939, **40**, p. 185. From *Summ. Curr. Lit.*, xx., **16**, 1940, p. 416.) Normal, fuzzy seed sprouted erratically, but acid-treated seeds sprouted promptly and absorbed water more freely. Cotton seed imbibed water even from saturated solutions of Na or Li chloride.

596. CHANGES IN GOSSYPOL DURING RIPENING AND STORAGE OF COTTON SEED. By M. Podolskaia. (*Masloboino Zhir. Delo.*, Moscow, May-June, 1939. From *Cott. Lit.*, x., **6**, 1940, p. 359.) (In Russian.) To ascertain whether gossypol is present in cotton seed as a primary product or as a derivative formed from other coloured compounds, changes occurring in the seed were studied. Colour changes from pale yellow through orange to red were observed by spectroscopic examination. The rapidity of the change varies in different kinds of seed, being faster in Egyptian than in American cotton seed. As a rule the gossypol in seed which has been stored a few months is in the red form.

597. COTTON AND RAMIE FIBRES: STRUCTURE. (*Text. Merc. and Argus*, **103**, 1940, p. 106. From *Summ. Curr. Lit.*, xx., **17**, 1940, p. 439.) The writer briefly reviews Miss Farr's conception of the structure of cellulosic fibres, and recent papers by Miss Clegg, and by Hock and Harris, that provide evidence for the older micelle theory. He suggests that there may be a parallel between the facts (1) that a small residuum of pectin in cotton so strongly restricts dissolution of the fibre in cuprammonium, and (2) that a small amount of regenerated cellulose produced in cellulose acetate filaments by saponification so greatly reduces the solubility of the acetate in acetone or acetic acid.

598. COTTON AND RAMIE FIBRE: CRYSTALLITE ORIENTATION. By E. Plötze and H. Person. (*Z. physikal. Chem.*, **B45**, 1940, p. 193. From *Summ. Curr. Lit.*, xx., **17**, 1940, p. 439.) Microphotometer curves obtained from X-ray spectrographs show that the half-angle is independent of the average degree of polymerization and is 15° for ramie fibre and 32° for cotton. The bearing of this on factors that determine the strength of fibres is stressed.

599. ANALYSIS OF COTTON AND VISCOSE RAYON MIXTURES. (*Text. Manufr.*, lxvi., **789**, September, 1940, p. 351.) Investigation of the calcium thiocyanate method of separating viscose and cotton is reported in the *Textile Colourist* by J. H. Levin and R. A. Martinell. Their experiments show that calcium thiocyanate (specific gravity 1.36 at 70° C.) will effectively dissolve viscose without harming cotton to any great extent, when the sample of cotton and viscose is placed in enough calcium thiocyanate to cover it, and then placed in an oven and kept at 87° C. for twenty-five minutes. The viscose was completely dissolved, while the cotton appeared unaffected except for slight gelatinization on the ends of the fibres.

The cotton loss averages 1 per cent. After treatment the cotton is washed with hot water to remove the dissolved viscose from the cotton fibres. Hot water is necessary, as washing with cold water will throw the viscose back out of solution. Only calcium thiocyanate solution of 1.36 specific gravity will dissolve the rayon, and both cotton and rayon are dissolved at boiling point (120° C.). The time is dependent on the weight of the sample; the samples tested were 0.15 to 0.72 grams of cotton. Every temperature in the oven was beneficial.

600. STAPLE FIBRE-COTTON AND COTTON-COTTONIZED HEMP MIXTURE FABRICS: RESISTANCE TO WASHING. By I. Mutti. (*Boll. Coton.*, **25**, 1940, p. 121. From *Summ. Curr. Lit.*, xx., **15**, 1940, p. 385.) Various German and Italian investigations of the effects of washing on the strength of staple fibre-cotton fabrics of the type used for sheets and similar purposes and on the strength of cotton-cottonized hemp fabrics are reviewed. Experimental data are quoted and the mixture fabrics are compared with all-cotton and all-linen fabrics. The figures show that the use of 16 per cent. staple fibre with cotton does not cause any appreciable increase of the loss in strength on washing, but the use of 33 per cent. staple fibre produces a marked deterioration in resistance to washing. Cottonized hemp in high proportions, even up to about 50 per cent., can be mixed with cotton without producing any serious effect on resistance of the fabric to washing, and fabrics composed of 50 per cent. cottonized hemp are as resistant to washing as all-linen fabrics. Treatment with urea-formaldehyde resins improves the resistance of staple fibre fabrics to washing.

601. PHYSICAL AND CHEMICAL CHANGES PRODUCED IN BLEACHED COTTON DUCK BY *Chaetomium globosum* AND *Spirochaeta cytophaga*. By R. E. Rogers *et al.* (*Tech. Bull.* 726, U.S. Dpt. Agr., Washington, D.C., 1940.) A bleached, desized 14 oz. cotton duck was sterilized, inoculated with *Chaetomium globosum* and with *Spirochaeta cytophaga*, two distinct types of cellulose-decomposing organisms, and then incubated on a mineral-salts agar. Samples of the fabric were removed at various intervals of time up to and including fifteen days for the fungus and eighteen days for the bacterium, and then tested physically and chemically. Both types of organisms caused a decrease in warp- and filling-breaking strengths, in weight, and in thickness of the fabric. Staple-length determinations further indicated that the strength was rapidly destroyed, and that even with extreme care during preparation of the samples considerable breakage of the fibres resulted. Toward the end of the period of incubation the rate of loss of weight and thickness of the fabric treated with the fungus decreased, whereas that of the bacterium increased. There was no significant difference in loss of weight when the carbon dioxide produced was removed as it was formed and when it was allowed to accumulate. The penetration of the hyphae into the fibres was shown by a differential staining method developed during this investigation. Fluidity, methylene blue absorption, moisture content, and ash content increased during incubation. Copper numbers of the fabric treated with *Ch. globosum* became progressively greater, while that of the material incubated with *S. cytophaga* at first decreased and then increased. Under the conditions of the experiment *Ch. globosum* deteriorated the fabric more rapidly and more completely than did *S. cytophaga*.

TRADE, PRICES, NEW USES.

602. WORLD COTTON SITUATION. (*U.S. Dpt. Agr.*, 1939. From *Exp. Sta. Rec.*, **82**, 3, 1940, p. 410.) A publication prepared for use at the International Cotton Meeting. The world cotton situation, development of the current situation, carry-over, production, supplies, consumption, international trade, and prices are discussed briefly. Tables are included showing for the United States and

other countries the acreage, yield, production, exports, imports, mill consumption, stocks, carry-over, supply, distribution, prices, price differentials, price ratios, etc., for cotton, farm income and returns from cotton and cotton seed, data as to cotton textiles and cotton manufacturing, cotton seed and cotton-seed products, and some information as to silk, rayon, and wool.

603. COTTON: WORLD PRODUCTION AND CONSUMPTION. (*Cott. Tr. J., Int. Edn.*, 1940, p. 16. From *Summ. Curr. Lit.*, xx., 10, 1940, p. 233.) (1) Production statistics are given for the seasons 1929-30 to 1938-39 for the United States, other North American countries, and the various cotton-growing countries of South America, Europe, Asia, Africa, and Australia. (2) Tables and graphs are given showing world consumption of all cotton, United States cotton, and other cotton by countries for the seasons 1929-30 to 1938-39. A notable feature is the decrease in world use of U.S. cotton and increase in consumption of other cotton. (3) Exports of raw cotton by the principal producing countries, imports by other countries and "carry-over" are tabulated and expressed in diagrams.

604. THE RAW COTTON OUTLOOK. (*Text. Wkly.*, 31/5/40, p. 640.) The American Government on May 24 gave the final revised figures of the 1939 United States cotton crop as 11,817,000 bales of 500 lb. each from a harvested acreage of 23,805,000 acres, with a yield per acre of 237.9 lb. The 1938 official figures were: production 11,944,340 bales, acreage 24,248,000, and yield 235.6 lb. The results from India, British Empire cotton-growing countries, and the lesser known areas generally show a reduced crop in 1939, but a great reduction on the crops grown in 1937. It is stressed that there should be no laxity in the field of production of raw cotton in 1940 if world demands are to be met. A careful analysis of industrial production in all consuming countries (and especially the man-hours now being worked and hourly rate of consumption in allied countries), the domestic consumption in U.S.A., and the excessively large volume of cotton exports since August, 1939, all go to prove that raw cotton is being used up at record high levels. Besides this high maintenance of activity and the large orders known to have been placed last autumn and early this year for a substantial volume of heavy cotton fabrics, there is another factor to bear in mind—namely, the use of raw cotton and cotton linters as the crude material for the manufacture of gun-cotton and high explosives, bandages, and surgical lint which the war has brought about. Cotton waste products and by-products are also finding consumption uses in new outlets which have quite dislocated the normal economic processes to which they are used in peace-time. Each of these new uses for cotton and cotton by-products in itself may only be a wavelet, but in total there can no longer be any doubt that such excessive spurts in the activity of each section has brought about in total a tidal wave of demand. It would appear to be wise policy by users and consumers of raw cotton and cotton goods to continue to cater well in advance for their requirements, regardless of the price factor.

605. RAW COTTON: PRICE CONTROL. By R. G. Saraiya. (*Ind. Text. J.*, 50, 1940, p. 197. From *Summ. Curr. Lit.*, xx., 12, 1940, p. 314.) A report of an address. The author gives a summary of recent Government price and production control measures and export subsidies in the United States, and discusses the difficulties of applying such schemes to the Indian cotton industry.

606. COTTON PRICES IN RELATION TO COTTON CLASSIFICATION SERVICE AND TO QUALITY IMPROVEMENT. By L. D. Howell and L. J. Watson. (*U.S. Dpt. Agr., Tech. Bull.* 699, 1939. From *Exp. Sta. Rec.*, 82, 4, 1940, p. 549.) Information is presented on (1) the influence of various kinds of cotton classification services on prices to growers; (2) factors affecting the usefulness of a cotton classification service, and some problems to be solved in connection with establishing and

maintaining a practical and dependable classification service; and (3) the influence of prices on quality produced.

607. COTTON PRICES IN SPOT AND FUTURES MARKETS. By L. D. Howell. (*Tech. Bull. No. 685, U.S. Dpt. Agr., Washington, D.C., 1939.*) Information is presented on the nature and sources of and the changes in the supply of and the demand for cotton; on the interrelationships between the supply, demand, and prices of cotton; and on the nature, characteristics, and functions of and prices in the various types of cotton markets. Such information is intended to serve as a basis for formulating plans for the production, marketing, and distribution of cotton.

608. COTTON HANDBOOK WITH RELATED DATA. (*U.S. Dpt. Agr., Agr. Adj. Admin., Statis. Pubn. 2, 1939. From Exp. Sta. Rec., 82, 3, 1940, p. 410.*) Statistical data are included for cotton acreage, yield and production, supply and distribution, stocks and carry-over, exports, imports, price and income, loans, cost of production, staple length, and planting and picking dates. Data are also included on rayon and other textiles, foreign trade, national, farm, and non-farm income, and population.

609. COTTON STATISTICS. By J. A. Todd. (*Text. Manufr., lxvi., 1940, No. 784 [April]* and subsequent issues.) The sixth paper of this series, published in April, contains a table of statistics of the African (non-British) cotton crops for the five-year periods 1914-15, 1919-20, 1924-25, and annually from 1930-31 to 1938-39. The second table summarizes the details of the Indian cotton crop by varieties for the seasons 1934-35 to 1938-39. The main point of this table is to bring out the fact that India now produces nearly 2,000,000 bales per annum of cotton of $\frac{7}{8}$ inch staple and above; in other words, cotton almost equal to the general run of the American crop. Other tables included are concerned with the quality of the American crop, U.S. consumption of cotton by varieties, and the highest and lowest futures prices each week from September 1, 1939, to March 31, 1940, of American cotton in New York and Liverpool, of Egyptian in Liverpool and Alexandria, and of Broach in Bombay.

In the seventh paper (May) the following tables are compiled and discussed: World's cotton crops 1935-36 to 1939-40; consumption in U.S., February, 1940, with January figures for comparison, and consumption in other countries for first half of 1939-40, with figures of previous season for comparison; minor cotton crops of Central and South America; spot prices of American cotton with other varieties as percentages of American weekly from September, 1939, to April, 1940.

In the eighth paper (June) the war effects on cotton movements in the season 1939-40 are reviewed, and the following tables are included: Supply and distribution of American cotton; U.S. consumption; U.S. stocks of American cotton; season's history of the American crop; highest and lowest futures (American) for any month up to and including October of next season; highest and lowest futures prices each week from December 1, 1939, to May 24, 1940, of American cotton in New York and Liverpool, of Egyptian in Liverpool and Alexandria, and of Broach in Bombay; Board of Trade cotton imports and exports (values) for the years 1935 to 1939 inclusive, and monthly from January, 1938, to April, 1940.

The ninth paper (July) contains tables of the Egyptian cotton crop by varieties from 1935-36 to 1939-40; Government forecasts of the Indian crop for the seasons 1914-15, 1919-20, 1924-25, and from 1929-30 to 1939-40; world's cotton consumption, monthly details from August, 1938, to July, 1939, and for American cotton only from August, 1939, to January, 1940; U.S. cotton consumption by varieties from August, 1938, to April, 1940; spot prices of American

cotton, with other varieties as percentages of American, from January to June, 1940.

The tenth paper (August) contains statistics of estimated acreage and production of American and Egyptian cotton, and tables of U.S. consumption for April, May, and June, 1940; U.S. stocks of American cotton in warehouses and mills in June, 1938 and 1939, and April to June, 1940; Board of Trade statistics of raw cotton and waste, cotton yarns and manufactures, etc., for April to June, 1940; highest and lowest futures prices each week from April 5 to July 26, 1940, of American cotton in New York and Liverpool, of Egyptian in Liverpool and Alexandria, and of Broach in Bombay.

The following tables are included in the eleventh (September) article: Season's history of the American crop; spot prices of American cotton, with other varieties as percentages of American; U.S. consumption for June and July. The most important events of the month were: (a) the announcement that the U.S. Government loan this season is to range from 9.16 cents to 9.90 cents, basis $1\frac{5}{8}$ inch middling net weight; (b) the long-expected announcement of the purchase of the coming Egyptian crop by the British Government, acting with the Egyptian Government.

610. AMERICA. COTTON FOR INSULATION. (*Text. Wkly.*, August 30, 1940, p. 254.) A programme was announced in May for the manufacture of insulation material from American cotton, linters, and waste for insulating houses and other buildings against heat, cold, and sound. The programme called for the manufacture of some 6,700,000 lb. of insulation by June 30, 1940, but only 500,000 lb. were manufactured and sold by that date. The Surplus Marketing Administration of the U.S. Dept. of Agriculture has now extended the date for the manufacture and sale of the remaining 6,200,000 lb. to June 30, 1941. Payment is at the rate of 6 cents per lb. of insulation, including fire-resisting impregnation, to manufacturers whose applications are approved and who agree to make, sell, and deliver the product.

611. UTILIZATION OF COTTON AND OTHER MATERIALS IN FERTILIZER BAGS. By R. J. Cheatham and R. B. Evans. (*U.S. Dpt. Agr., Bur. Agr. Econ.*, 1939. From *Exp. Sta. Rec.*, 82, 2, 1940, p. 179.) Information on the types of bags used in the fertilizer industry—i.e., cotton, lined and unlined burlap, and paper—and on demand, cost, and other factors influencing the use of cotton fertilizer bags was derived from a survey of fertilizer manufacturers in 1937 and from other sources. In 1937, 82 per cent. of all fertilizer tonnage was packed in burlap bags, 12 per cent. in cotton, and 6 per cent. in paper, while a survey made in 1927-28 showed 98 per cent. bagged in burlap, 2 in cotton, and none in paper. Cotton bags were used more extensively than all other types combined in Mississippi, Arkansas, Louisiana, and Texas, and extensively in Alabama, Tennessee, Georgia, and Virginia. Paper bags were used most extensively in the Pacific North-West and in New York, New Jersey, and Wisconsin, and burlap bags were used generally elsewhere.

612. COTTON LININGS FOR IRRIGATION DITCHES. (*Sci. Supplmt.*, December 15, 1939. From *Madras Agr. J.*, May, 1940, p. 165.) A section of an irrigation canal in Idaho was lined with a mixture of asphalt and gravel backed by heavy cotton fabric. Water losses in this section, which formerly amounted to 20 to 30 per cent., have now been cut down to $1\frac{1}{2}$ per cent. The standard method of lining irrigation canals is with concrete, which pays for itself despite high cost. The cotton-gravel-asphalt lining is cheaper.

613. COTTON DRIVING ROPES: APPLICATION. (*Silk and Rayon*, 1940, 14, p. 474. From *Summ. Curr. Lit.*, xx., 14, 1940, p. 357.) Tables are given of (1) the most suitable dimensions of the pulley grooves for ropes of $\frac{1}{4}$ inch to 2 inches

diameter, (2) minimum advisable pulley diameters for ropes of $\frac{3}{4}$ to 2 inches diameter running at 1,000 to 7,000 feet per minute, and (3) the horse-power transmitted by various "Lambeth" ropes (diameters and weights given) running at various speeds.

614. COTTON FABRIC: USE IN ROAD CONSTRUCTION. (*Nature*, **145**, 1940, p. 699. From *J. Text. Inst.*, June, 1940, A313.) In the construction of the new "cotton roads" in America, cotton fabric is laid on a surface treated with bituminous material, which is also applied to the fabric and completely covered with crushed mineral aggregate. The crushed cover material is rolled in and a lighter application of bituminous material is laid down and covered with a layer of chips, which are rolled in with a heavy roller. The best results have been obtained with cloth of comparatively open weave. The breaking strength varies between 25 and 45 lb. (grab method) according to grade. The most practicable fabrics cost between 450 and 750 dollars a mile for a road 18 feet wide. In New Jersey cotton fabric and tar were applied on 600 linear feet of a gravel road, and the road was inspected after a year of service. Soft broken areas were observed on the part of the road where the fabric had not been used, whilst the part that had been treated with cotton fabric was free from broken places and was tougher and less easily punctured with a screwdriver. Recent reports from a number of highway departments indicate that short test sections of bituminous-surfaced roads having cotton as part of their construction have decreased maintenance costs and require less patching. The South Carolina Highway Department has used cotton fabric on bridge surfaces also with a marked degree of improvement in maintaining a satisfactory bituminous surface.

615. SANDBAGS FROM COTTON WASTE. (*Financ. News*, Bombay, December 23, 1939. From *Cott. Lit.*, March, 1940, p. 160.) "A new type of sandbag in 'imitation hessian' manufactured from raw cotton waste has been placed on the market by a Bombay cotton mill. . . . When the price of jute reaches Rs. 80 or 90 the manufacture of cotton hessian from waste, it is claimed, becomes a commercial proposition."

MISCELLANEOUS.

616. A HANDBOOK OF MALARIA CONTROL. By R. Svensson. We have received from the Ross Institute of Tropical Hygiene a copy of this booklet, which is primarily intended to assist laymen engaged in the control of malaria on estates, plantations, and mines in the tropics. The author is an Assistant Director of the Ross Institute. The first impression is of 6,000 copies, and the Shell group of oil companies generously agreed to defray the cost of publication. To facilitate distribution overseas and to avoid duplication, the principal offices of the associated companies of the Shell group will hold stocks, and requests for copies should be made direct to these centres. Distribution in the British Isles will be made through the Ross Institute, and applications for copies should be addressed to the Organizing Secretary. The various chapters of the book deal with the nature of malaria, the vector *Anopheles*, methods of control—natural methods, draining, oiling, etc.—and insecticides. Appendices are included on the collection, maintenance, and identification of mosquitoes, and the booklet also contains some illustrations and diagrams.

ADDENDA.

617. THE COURSE OF EVOLUTION BY DIFFERENTIATION OR DIVERGENT MUTATION RATHER THAN BY SELECTION. By Dr. J. C. Willis, F.R.S. (Camb.: The Univ. Press, 1940. Price 12s. 6d.) In this book the author has assembled the arguments made familiar by his previous works, reinforced by a wealth of further illustration,

and launched them in a mass attack on the Darwinian theory of natural selection as the motive force in the evolution of plants. He holds with Guppy that to study the working of evolution from its end results in species and varieties is to begin from the wrong end, and that this method fails entirely to account for the definite and unbridged characters which distinguish the higher divisions—differences which cannot be shown to have any functional value whatever. The evidence put forward in the author's "Age and Area" is cited to show that species of limited distribution occupy this position on account of their recent origin, and are not, as the Darwinians are held to require, the relics of an older and superseded flora. As Darwin studied barnacles, Dr. Willis has specialized in the Podostemaceæ, and shows that in this family of water-plants a wealth of diversity has appeared under conditions almost perfectly uniform. Having disposed of natural selection, with arguments far too many-sided to be noted here, as the force providing the structurally different forms of life, the author accepts it as the means by which they are functionally adapted for their places in the local biological economy. What, then, is the force by which evolution works? Some "great thought or principle that has resulted in its moving as an ordered whole, and working itself out upon a definite plan, as other branches of science have already been shown to do. . . . Differentiation is not based upon adaptation at all . . . there is a general law, probably electrical, at the back of it." It is a remarkable fact that it has been possible to write this book, postulating great structural mutations as the means by which differentiation has been achieved, without more than the very occasional use of a term from the great mass of information on the mechanism of inheritance which forms the basis of the modern science of genetics.

618. REPORT OF THE THIRD WEST AFRICAN AGRICULTURAL CONFERENCE, NIGERIA, JUNE, 1938. (Govt. Printer, Lagos. Received June, 1940.) Volume I. (656 pages) contains the papers discussed at the Conference, prepared by officers of the Departments of Agriculture in Nigeria, Gold Coast, and Sierra Leone, covering the agricultural industries, conditions and organization in these countries. (See following abstracts.) Volume II. summarizes the Proceedings of the Conference.

Résumé of Botanical Work carried out in the Northern Provinces (Nigeria). By J. K. Mayo. Includes a summary of the early years of cotton work done by the Dept. of Agriculture from 1912 to 1923 at Maigana (development of Allen) and of subsequent selection from Allen. A list of other introductions from 1921 to 1937 is also given, with observations on their trials. Work on numerous other crops is recorded.

Ishan Cotton-Seed Multiplication. By A. E. Trotman. An account of the measures taken to maintain the quality of the variety grown for export in Southern Nigeria. The scheme provides for a single plant selection each year, the seed from which is multiplied for general distribution five years later.

Umuahia Agricultural Station (Nigeria). By F. E. Buckley. Enquiries into the possibilities of mixed farming and meat production.

Soil Types and Manurial Experiments in Nigeria. By H. C. Doyne *et al.* Description of the general characteristics of Nigerian soils and of the dominant soil types based on the examination of over 5,000 samples. The survey of soils has been closely related to crop investigations and has not taken the form of isolated research. Methods of analysis are described and analytical figures given in an appendix. The second section of the paper discusses in the light of chemical and physical observations the evidence available with respect to manuring. This tends to show that in general the main need of Nigerian soils is phosphate, and that even in organic manures this constituent is more important than nitrogen or organic matter as such. The importance of mineral nutrients in general is emphasized. A provisional map of the main soil types is appended.

Experiments on the Maintenance of Soil Fertility by Green Manuring (Nigeria). By C. C. Webster. Describes and discusses the well-known experiments carried out for sixteen years at Moor Plantation (Ibadan). The object has been to work out a method of permanent cultivation to replace the existing native practice of shifting cultivation where mixed farming is not possible. The results demonstrate that ordinary land can be farmed under a rotation involving three short-term green manure crops every four years without any appreciable decline in fertility over a period of sixteen years. Burning the cover has proved as effective as burying green crops, and is often more convenient. Little success has attended the efforts made to secure the adoption of the system. One reason is that mixed cropping is a universal feature of native farming, and modifications to meet this preference are now being introduced.

A Review of Experimental and Extension Work carried out at the Yandev Agricultural Station, Benue Province (Nigeria). By G. W. Briggs. Certain districts have population densities from 250 to 300 per sq. mile and land hunger is becoming a real problem. The work described has been devoted to finding a method of maintaining soil fertility by green manuring. Under existing pressure on land the period of bush fallow is steadily decreasing; spear grass (*Imperata arundinacea*) is displacing *Andropogon* and *Pennisetum* spp. and makes subsequent cultivation difficult. *Mucuna* has proved to be the most satisfactory legume for use under plantation conditions, but the labour required makes it unpopular with natives, and an easier line of approach through the replacement of bush fallow by a persistent cover crop (*Cajanus* or *Calopogonium*) is being explored.

Education and Agriculture (Nigeria). By G. N. Herington. A fundamental discussion of the problems of education in native agricultural communities. The African farmer of the old type, whose methods remain uninfluenced by modern changes, is a good farmer, because his methods are so well adapted to the conditions in which he lives.

Cotton Selection in Southern Nigeria. By E. H. G. Smith. The replacement of an established, and in many respects an excellent, cotton such as Ishan A is not a project to be undertaken lightly. No new variety is likely to be available for some time, on account of the very thorough experiments that must be made before the replacement of Ishan A could be considered.

Umuahia Agricultural Station (Nigeria): Review of Farm Work, 1923-37. By F. E. Buckley. An account of crop cultivation (annual and permanent) and soil amelioration experiments in an area of sandy, intensely acid soils (pH 4.0-6.0) generally deficient in mineral content. *Calopogonium* gives an excellent cover except in the poorest of soils, if sown early enough; a native shrub (*Acioa barteri*) flourishes where this and other legumes fail, and is capable of restoring fertility to barren soils.

Review of Nkwele Farm Work, 1930-37 (Nigeria). By L. P. Henderson. Studies of measures to maintain fertility in country including and bordering on the oil-palm belt. The familiar problem exists of large areas brought below or near the limits of cultivation by the failure of native methods to meet the pressure of increasing population. Results of trials with green manures seem to favour the use of *Mucuna* on soils in good condition, *Calopogonium* on soils in average or poor condition. On very poor soils no legume succeeds, but native shrubs can be used to grade them up to a higher level.

Kano Agricultural Station (Nigeria): Review of Experiments, 1925-38. By J. H. Palmer and M. W. Gibbon. Results, mainly tabular, of trials concerning methods applicable to a range of annual crops, including cotton.

Samuru Experimental and Stock Farm (Nigeria): Summary of Crop Experiments. This station is near Zaria in the Northern Province, and was first cleared in 1923. The report includes a good deal of information on

experiments in the use of farmyard manure, and an account of yield trials with cotton.

Education and Agriculture (Gold Coast). By H. Nicholas. A short account of the efforts (mostly abortive) which have been made by the Dept. of Agriculture to provide educational institutions.

Preliminary Investigations on the Fly Population of Stable Manure Heaps and Measures for the Prevention of Breeding (Gold Coast). By G. S. Cotterell. Supplies details of experiments with horse and cattle manures. Suggests close packing and covering heaps with oiled hessian.

Agricultural Methods in Sierra Leone and their Effects on the Fertility of the Soil. By F. J. Martin *et al.* Throughout Sierra Leone rice is the staple crop, and for dry land farming shifting cultivation is universal, the period of cropping over the greater part of the country being one year only. Practically all the forest has disappeared and rapid degeneration in the vegetation of the country is taking place. In recent years pressure has been relieved by the development of swamp cultivation, and expansion in this direction, for which there is plenty of room, offers the best hope of a permanent remedy.

619. UGANDA: COTTON REPORTS, 1938-39. (*Ann. Rpt. Dpt. Agr. Uganda, 1938-39.* Pt. II. recently received.) From the report of the Entomological Section we learn that investigation on cotton pests at Serere were continued as in former years. Figures for the *Dysdercus* population remained practically the same as in the two previous seasons. Monthly figures obtained for pink bollworm indicated an increase in infestation of bolls of 1 per cent. in September to 10 per cent. in December. Late in December in the same area, an estimate was made of the total damage by caterpillars to bolls: of 3,000 bolls examined, 50 per cent. had been destroyed, but only 3 per cent. of this damage was due to pink bollworm, the remainder being caused by *Argyroproctea leucotreta*. A survey carried out in Usuku County in Teso showed no evidence of pink bollworm there. The pest was very common in Bugondo in plots near the ginnery. At Mulondo some 6 per cent. of the cotton was infested. Results are included of extensive observations carried out at Serere on *Lygus* and jassid; remarkable resistance to both pests was exhibited by the strain S.P.102.

The main interest of the Plant Pathological Section was concerned with cotton wilt. A number of isolations of *Verticillium dahliae* were made from a wide range of host plants including cotton. Infestations with almost all strains of the fungus were obtained on B.P.52, which is very susceptible to wilt under field conditions at Bukalasa.

In connection with the breeding and selection work carried out by the Botanical Section, the best results were obtained with two lines of B.181. This is a valuable variety since it is highly resistant to blackarm and to wilt. Its lint characters are, however, poor, and it is hoped to improve these by further selection and by hybridizing with B.P.52. One of the B.P.50 group (B.P.220) also showed promise of resistance to blackarm and wilt. The best all-round performance at Serere was achieved with S.P.155. During the season blackarm disease was rather more prevalent, and *Lygus* was particularly heavy at the seed farm at Serere.

620. A VISIT TO THE UNITED STATES OF AMERICA TO STUDY SOIL CONSERVATION. By C. Maher. (Govt. Printer, Nairobi, 1940. Price 1s.) Account of an official visit paid by a Kenya Soil Conservation Officer to the U.S.A. Reviews the history and operations of the Soil Conservation Service of the U.S. Dept. of Agriculture, and discusses their significance in relation to conditions in Kenya. Parallels can be drawn, allowing for differences in scale, between every agricultural and social feature leading towards soil erosion in the two countries. Invokes

the principle of trusteeship of the backward native races to support a suggested request for Imperial financial assistance.

621. CULTIVO Y COMERCIO DEL ALGODON EN MEXICO. (Sec. de Agr. y Fomento Dir. de Econ. Rural, Mexico, 1939.) This monograph, by an assembly of authors, deals exhaustively with the agronomy and economics of cotton production in Mexico, which reached its peak production in 1936 with 86,000 tons (of 1,000 kgs.), equivalent to some 38,000 bales of lint (of 230 kgs.). Large numbers of graphs and tables are given and two maps illustrate the geographical distribution of production.

622. REPORT ON A JOURNEY TO PARTS OF THE WEST INDIES AND THE UNITED STATES FOR THE STUDY OF SOILS. By G. Milne. (Govt. Press, Dar-es-Salaam. 1940. Shs. 2/50.) The study journey here described by the Soil Chemist of the East African Agricultural Research Station at Amani was made possible by a grant from the Carnegie Corporation of New York. The value of this opportunity of studying the results obtained from the pursuit of soil science in the U.S.A. and the American tropics, and of applying the lessons so learned to African problems, is fully evident, and the discussion of the many soil questions raised by the author's observations is carried out with a breadth of view and a liveliness of expression not always characteristic of the subject. Not only soil specialists but agriculturists (and foresters) in general will be interested and entertained by perusal of the report.

623. APERÇU SUR L'EXPERIMENTATION CULTURALE A LA STATION DE BAMBESA DURANT LA CAMPAGNE 1939-49. By R. Pittery. (*Rpt. Ann. pour l'Exer.*, 1938. Pt. II. I.N.E.A.C., 1939, p. 157.) Part I. gives a résumé of experiments with cotton cultivation at the Bambesa Experiment Station, dealing with comparative yields of local and introduced varieties, simple and combined sowing and spacing trials, and methods of manuring and cultivation. Part II. discusses experiments with food crops, including sixteen varieties of soya bean, and Part III. contains notes on questions of regeneration and rotation, including the making of compost.

624. QUELQUES ANALYSES DE COTON-GRAINES DE LA RÉGION NORD. CAMPAGNE 1937-38. By M. Waelkens. (*Rpt. Ann. pour l'Exer.*, 1938. Pt. II. I.N.E.A.C., 1939, p. 184.) A comparative analysis, in respect of productivity, fibre-length, ginning percentage, seed and lint index, of a large number of samples of seed cotton grown in the various stations and zones of the Nord Region of the Congo, representing several pedigree-lines as well as "local" cottons derived from previous mass selection. The general conclusion is that pedigree selection is commencing to give results of definite value. The evidence presented has a further interest in the range of variation associated with differences of locality.

625. VARIATION IN PATHOGENICITY AND CULTURAL CHARACTERISTICS OF THE COTTON-WILT ORGANISM, *Fusarium vasinfectum*. By G. M. Armstrong *et al.* (*Phytopathology*, xxx., 6, 1940, p. 515. From *Rev. App. Mycol.*, xix., 10, 1940, p. 592.) Thirteen monospore cultures of *Fusarium vasinfectum*, the agent of cotton wilt, grown on potato dextrose agar at 28° C. at the South Carolina Agricultural Experiment Station in 1937, gave rise after varying periods to variants generally characterized by sparser aerial mycelium and a slower growth rate than the parent strains. No case of reversion to the parental type was observed during seventeen successive transfers, and in fact the mutants, which in their turn may produce secondary variants, tended to predominate over the parents, even to the exclusion of the latter. In soil inoculation experiments with fourteen isolates of *F. vasinfectum*, of which four were variants, pathogenicity was to some extent correlated with profuse mycelial development and rapid

growth, while lengthy maintenance in culture (for up to six years) caused a reduction of virulence. Two of the four saltants included in the trials were markedly less virulent than their parents, the others not deviating so sharply from the type. A much higher degree of resistance was shown by the Dixie Triumph 12, Super Seven, and Semiwilt varieties than by Farm Relief 2, but the fungus was reisolated from a large number of plants showing neither internal nor external symptoms of infection. It is considered possible that variants of *F. vasinfectum*, differing in pathogenicity to cotton, may occur in the field.

THE EMPIRE COTTON GROWING REVIEW

INDEX OF AUTHORS TO VOL. XVII.

	PAGE
ABAZA PASHA, F.	"White Egyptian Cotton: Production" - - - 25
ACHARYA, C. N. ..	"Comparison of Different Methods of Composting Waste Materials" - - - 36
	"Composts and Soil Fertility" - - - 107
ADAMSON, A. M., and BAKER, R. E. D.	"The Work of the West Indian Plant Quarantine Station from 1934 to 1939" - - - 18
ADLE, A. H. ..	"Iran: First Outbreak of the Pink Cotton Bellworm, <i>Pectinophora (platyedra) gossypiella</i> " - - - 115
AFZAL, C. M. ..	"A New Strain of Desi Cotton for South-Western Tract of the Punjab" - - - 8
AFZAL, M., and SINGH, S.	"The Genetics of a Petaloid Mutant in Cotton" - - - 62
AHMAD, N. ..	"The Effect of Fibre-Weight per inch on the Spinning Quality of some Indian Cottons" - - - 73
	"Indian Cottons: Hair-Weight and Spinning Quality" - - - 5
	"Sind: Sea Island Cotton: Growth in India" - - - 8
	"Spinning Test Reports on Indian Cottons, 1938-39" - - - 5
	"Spinning Test Reports on Indian Cottons, 1939-40" - - - 86
	"Technological Reports on Indian Cottons, 1938-39" - - - 6
	"Technological Reports on Indian Cottons, 1939-40" - - - 86
	"Technological Reports on Standard Indian Cottons, 1939" - - - 6
	"Technological Reports on Trade Varieties of Indian Cottons, 1939" - - - 6
AHMAD, N., and GULATI, A. N.	"The Effect of Storage at Different Relative Humidities on the Strength and Colour of Cotton" - - - 74
AHMAD, N., and VENKATARAMAN, V.	"Empirical Relationships between Count, Twist and Strength of Cotton Yarns" - - - 76
AINSWORTH, G. C.	"The Nomenclature of Plant Viruses" - - - 59
AMERICAN SPINNING Co.	"American Cotton Mill Reorganization" - - - 94
AMIN, K. C. ..	"A Preliminary Note on Interspecific Hybridization and Use of Colchicine in Cotton" - - - 136
	"Interspecific Hybridization between Asiatic and New World Cottons" - - - 134
ANDERSON, D. B. ..	"Growing Cotton Boll: Internal Temperature" - - - 132
ARMSTRONG, G. M., et al.	"Variation in Pathogenicity and Cultural Characteristics of the Cotton-Wilt Organism, <i>Fusarium vasinfectum</i> " - - - 155
ASHMORE, W. G. ..	"Argentine Cotton Industry: Expansion" - - - 99
	"Brazilian Cotton Industry" - - - 27
ASSOCIATION OF COTTON TEXTILE MERCHANTS	"American Cotton Spinning and Manufacturing Industry: Output, 1939" - - - 94
AYLEN, D. ..	"The Ridger Grader" - - - 34
	"Soil and Water Conservation" - - - 32, 105
AYYAR, V. R., et al.	"Some Ploughing Experiments" - - - 111
BABCOCK, E. B. ..	"Recent Progress in Plant Breeding" - - - 129
BADAMI, V. K. ..	"Improvement of Crops in Mysore: A Review of Twenty-five Years' Work" - - - 8
BAIN, D. C. ..	"Effect of Sulphuric Acid Treatment on Fungi and Bacteria Present on Cotton Seed from Diseased Bolls" - - - 55

	PAGE
BALIABO, N. ..	"The Dynamics of the Mobile Forms of Nitrogen in the Soil, and Agro-Chemical Control in Cotton Plantations" 109
BARBER, C. R. ..	"Egypt: Review of the 1938-39 Cotton Season" 24
BARBER, G. W. ..	"Hibernation of the Corn Earworm in Southern Connecticut" 47
BARBER, G. W., and DICKE, F. F.	"Effect of Temperature and Moisture on Over-Wintering Pupæ of the Corn Earworm in the North-Eastern States" 46
BARDUCCI, T. B.	"Apuntes sobre la Organizacion de la Seccion de Genética de Algodon, del Departamento de Genética Vegetal, de la Estacion Experimental Agricola de la Molina" 29
	"Departamento de Genética Vegetal: Memoria de la Seccion Genética de Algodón (Valle de Lima)" 127
BARROWS, F. L. ..	"Cotton Fibre: Structure" 139
BASS, L. W., and OLCOTT, H. S.	"Cotton Seed: Technical Applications: Chronology" 113
BA TE, A. . . .	"Cotton Pests in Burma" 41
BAWDEN, F. C. ..	"Plant Viruses and Virus Diseases" 126
BEASLEY, J. O. ..	"Hybridization of American 26-Chromosome and Asiatic 13-Chromosome Species of <i>Gossypium</i> " 133
	"The Origin of American Tetraploid <i>Gossypium</i> Species" 133
	"The Production of Polyploids in <i>Gossypium</i> " 137
BENNETT, C. A., and GERDES, F. L.	"Some Regional Influences on Ginning Problems and Methods" 112
BENNETT, C. A., and SHAW, C. R.	"Overhead Cleaner-Drying Systems for Seed Cotton" 39
BENNETT, H. H. ..	"Soil Conservation" 105
BERKLEY, E. E. ..	"Cellulose Orientation, Strength, and Cell Wall Development of Cotton Fibres" 138
	"Cotton Fibre: X-Ray Structure and Strength at Different Stages of Growth" 140
BERTRAND, J. ..	"Belgian Textile Industry: Distribution and Magnitude" 26
BLAIR, A. W. ..	"Fertilizer Materials and Mixed Fertilizers" 108
BLAIR, A. W., and WAKSMAN, S. A.	"Soil Organic Matter and the Living Plant" 31
BOMBAY ECONOMIC AND INDUSTRIAL SURVEY COMMITTEE	"Indian Hand-Loom Industry: Activity" 86
BORDEN, R. J. ..	"A Modern Statistical Analysis for Field Experiments: The Analysis of Variance for Simple Factorial Experiments" 36
BORON AGRICULTURAL BUREAU	"Boron in Agriculture" 35
BOTELHO DA COSTA, J. V.	"A Critical Survey of Investigations on the 'Wilting Coefficient' of Soils" 31
BOTERO, R. C. ..	"La Stenosis: Un Achicamiento y Arrugamiento del Algodón" 126
BOUYOUCOS, G. J.	"Effect of Organic Matter on the Water-Holding Capacity and the Wilting Point of Mineral Soils" 104
	"A Mechanical Device for Determining the Permanent Wilting Point of Soils by Means of the Cohesion Method" 31
BOZA, B. T. ..	"Aspectos Geneticos del Algodonero en Piura" 29
	"El Problema del Algodon" 29
BOZA-BARDUCCI, T., and MADOO, R. M.	"Wild Peruvian Cotton: Genetics" 132
BRADFIELD, R. ..	"Perennial Grasses and Soil Structure" 104
BRAMBLE, C. P. ..	"Indian Cotton Marketing" 3
BRANNON, L. W. . .	"Control of the Corn Earworm on Fordhook Lima Beans in Eastern Virginia" 120
BRIGGS, G. W. ..	"A Review of Experimental and Extension Work carried out at the Yandev Agricultural Station, Benue Province (Nigeria)" 153
BRIMLEY, C. S. ..	"The Insects of North Carolina" 44

	PAGE
BRITISH COTTON GROWING ASSOCIATION	
"35th Annual Report, 1939"	88
BRITISH COTTON INDUSTRY RESEARCH ASSOCIATION and JONES, E. H.	
"Electrical Resistance Type Moisture Content Determination Apparatus"	144
BRIXHE, A. ..	
"La Fusariose ou Wilt du Cotonnier"	58
"Le Wilt du Cotonnier"	127
BROOKS, F. T. ..	
"Some Recent Investigations on Epidemic Plant Diseases"	122
BROWN, C. H. ..	
"Egyptian Cotton Varieties"	25
BROWN, H. B. ..	
"Registration of Improved Cotton Varieties. II"	133
BROWN, H. B., et al.	
"Louisiana: A Description of Cotton Varieties Recommended"	97
BROWN, H. B., and POPE, H. W.	
"Effect of Nitrogen, Phosphorus, and Potassium in Fertilizers on the Earliness of Cotton"	34
BROWN, J. G. ..	
"Cotton Seed Tests: Permeability"	146
BUCKLEY, F. E. ..	
"Umuahia Agricultural Station (Nigeria)"	152
"Umuahia Agricultural Station (Nigeria): Review of Farm Work, 1923-37"	153
BURGES, A. ..	
"Soil Fungi and Root Infection: A Review"	54
BURGES, A. E. ..	
"Soil Erosion Control"	33
BURGESS, J. S., JUN.	
"Crushing Cotton Seed Co-operatively"	113
BURNS, W. ..	
"The Progress of Agricultural Science in India during the Past Twenty-Five Years"	3
CAMERON, G. S. ..	
"Some Hints for Cotton Growers (in Southern Rhodesia)"	90
CAPINPIN, J. M., and KHAMBANONDA, I.	
"Studies in the Cytology and Cross-Compatibility of some Cotton Varieties"	62
CASSIDY, T. P., and BARBER, T. C.	
"Hemipterous Insects of Cotton in Arizona: Their Economic Importance and Control"	43
CASSIE, A. B. D. ..	
"Regain of Textiles and Humid Atmosphere Changes"	76
C. B. ..	
"Recent Tendencies in Cotton Spinning"	143
CHAVIRIN, I. ..	
"A Cultura do Algodoeiro e a Técnica do Aproveitamento da sua Produção"	110
"Algumas questões Técnicas sobre a Biologia e Fisiologia do Algodoeiro"	130
CHEATHAM, R. J., and EVANS, R. B.	
"Utilization of Cotton and other Materials in Fertilizer Bags"	150
CHEN, J. S. ..	
"Hopei Cotton Improvement and the Future of the Stoneville No. 4"	28
CHORLEY, J. K. ..	
"Southern Rhodesia: Cotton Pests in 1938"	42
CHRISTIDIS, B. G.	
"The Viability of Cotton Seed as affected by its Moisture Content"	110
"Variability of Plots of Various Shapes as affected by Plot Orientation"	37
"Variety Trials carried out by the Greek Cotton Institute during the Years 1932-37"	28
CHUNILAL, MEHTA AND Co.	
"Indian Cotton: Review of the 1938-39 Season"	3
CLAUS, F. ..	
"L'Influence Bienfaisante de la Culture du Coton pour l'Indigène"	101
CLEGG, G. G. ..	
"The Examination of Damaged Cotton by the Congo Red Test: Further Developments and Applications"	144
COBB, C. K. ..	
"American Cotton Ginnery: Improvement"	21
COLLINGS, G. H. ..	
"Commercial Fertilizers: Their Sources and Use"	108
COMBER, N. M. ..	
"An Introduction to the Scientific Study of the Soil"	30
COMPTON, J., and HEWER, F. E.	
"Studies on the Development of Cotton Fibre. I. Relation of Development of Crude Cotton Fibre to the other Principal Boll Constituents"	138
COOPER, M. R. ..	
"Statistics of Cotton and Related Data"	80
CORNISH, E. A. ..	
"Incomplete Randomized Block Experiments: Statistical Allowance for Missing Values"	110
COSTA, A. S., and FRAGA, C. G.	
"Sobre a Natureza da Ramulose ou Superbrotamento do Algodoeiro"	57

	PAGE
COTTERELL, G. S.	"Preliminary Investigations on the Fly Population of Stable Manure Heaps and Measures for the Prevention of Breeding (Gold Coast)" - 154
COTTON TEXTILE INSTITUTE, NEW YORK	"Cotton from Raw Material to Finished Product" - 79
CROWTHER, F.	"Impressions of Cotton Growing in India by a Visitor from Egypt and the Sudan" - 3
CUMLEY, R. W., and GOLDSMITH, G. W.	"Preliminary Serological Studies of <i>Phymatotrichum omnivorum</i> " - 125
CUNNINGHAM, A., and SMITH, A. M.	"The Microbiology of Silage made by the Addition of Mineral Acids to Crops Rich in Protein. I. Quantitative Chemical and Bacteriological Data" - 82
CURBAN, C. H.	"African Tachinidæ. II" - 114
DARLINGTON, C. D.	"The Biology of Crossing-Over" - 129
DASTUR, J. F.	"Stem Breaking of Cotton" - 58
DAVIDSON, G. F.	"The Properties of the Oxycelluloses formed in the Early Stages of the Oxidation of Cotton Cellulose by Periodic Acid and Meta-periodate" - 138
DAVIES, F. L.	"The Effect of Various Nitrogenous Fertilizers on Soil Factors Affecting the Yield of Crops" - 108
DEETER, E. B.	"The Role of Strip-Cropping in Erosion Control in the Blacklands of Texas" - 33
DE GILLIS, E.	"Il Cotone Italiano" - 101
DE MEDELLA E SILVA, J. B.	"O Gafanhoto <i>Eutropidacris cristata</i> L. no Norte de Minas" - 49
DE OLIVEIRA FARIA, C. V.	"Escola de Agronomia do Nordeste Serviço de Melhoramento do Algodão na Paraíba" - 100
DICK, J. B.	"Fertilizers in Relation to Incidence of Wilt as Affecting a Resistant and a Susceptible Variety (of Cotton)" - 127
DICKE, F. F.	"Seasonal Abundance of the Corn Earworm" - 119
DITMAN, L. P., and WEILAND, G. S.	"The Metabolism of the Corn Earworm. II. Glycogen and Moisture" - 47
DORMAN, C., and COLEMAN, R.	"The Effect of Calcium Arsenate upon the Yield of Cotton on Different Soil Types" - 108
DOYNE, F. C., et al.	"Soil Types and Manurial Experiments in Nigeria" - 152
DRAPER, C.	"The Spinning and Doubling of Coarse Cotton Yarns" - 77
DUNLAVY, H. E., et al.	"Oklahoma: Cotton Variety Tests, 1939" - 98
DU TOIT, F. M.	"Cotton Culture in South Africa" - 14
EAST INDIA COTTON ASSOCIATION, LTD.	"Bombay Cotton Annual, 1938-39, No. 20" - 6
ELAYDA, A., and DE JESUS, F.	"Cotton Growing in the Philippines" - 30
EMPIRE COTTON GROWING CORPORATION	"Memoirs of Cotton Research Station, Trinidad" 66, 68, 69
ERGLE, D. R., et al.	"Progress Reports from Experiment Stations, 1938-39" - 9
	"Carbohydrates of the Cotton Plant under Different Seasonal Conditions and Fertilizer Treatment" - 67
EWING, K. P., and CRAWFORD, H. J.	"Egg Parasites of the Cotton Flea Hopper" - 48
EZEKIEL, W. N.	"Cotton Root Rot Organism: Survival" - 125
	"Girdling of Cotton Plants as affecting Survival of <i>Phymatotrichum omnivorum</i> " - 57
EZEKIEL, W. N., et al.	"Texas: Plant Pathology and Physiology" - 124
FARR, W. K.	"Behaviour of the Cell Membrane of the Cotton Fibre in Cuprammonium Hydroxide Solution" - 72
FIELDING, W. L.	"Science and Empire Cotton Production" - 15
FIFE, L. C.	"Insects and a Mite found on Cotton in Puerto Rico, with Notes on their Economic Importance and Natural Enemies" - 42

	PAGE
FISHER, R. A. .. "The Comparison of Samples with possibly Unequal Variances" ..	110
FLORES, F. B. .. "Viability of Seeds of Cotton as Affected by Moisture and Age under Different Methods of Storing" ..	62
FOLSOM, J. W., and WOKE, P. A. .. "The Field Cricket in Relation to the Cotton Plant in Louisiana" ..	49
FORWOOD, D. F. .. "Cotton Building Insulation Material: Application" ..	80
FRANSEN, C. J. H., and MULLER, H. R. A. .. "Insect Pests of the Cotton Crop in Java" ..	42
FULTON, H. J. .. "Arizona: Weather in Relation to Yield of American-Egyptian Cotton" ..	96
GAHAN, A. B. .. "Two New Chalcidoid Egg Parasites (<i>Eulophidae</i> and <i>Mymaridae</i>)" ..	53
GAINES, J. C., and EWING, K. P. .. "The Relation of Wind Currents, as Indicated by Balloon Drifts, to Cotton Flea Hopper Dispersal" ..	48
GAINES, S. H., <i>et al.</i> .. "Bibliography on Soil Erosion and Soil and Water Conservation" ..	32
GALLOTTI, J. .. "Egyptian Textiles: History" ..	25
GALLOWAY, L. D., and BURGESS, R. .. "North African Textiles: History" ..	102
GANESHAN, D. .. "Applied Mycology and Bacteriology" ..	122
GENERAL RADIO CO., MASS., U.S.A. .. "Aceto-Carmine Smear Technique for Cotton Cytology" ..	63
GERDES, F. L., <i>et al.</i> .. "A Stroboscope for the Textile Industry" ..	143
GERDES, F. L., and BENNETT, C. A. .. "Drying Seed Cotton" ..	38
GHERQUIERE, J. .. "Effect of Cleaning Seed Cotton on Lint Quality and Ginning Efficiency" ..	112
GIDDINGS, N. J. .. "Preventing Gin Damage to Cotton" ..	39
GLICK, P. O. .. " <i>Helopeltis</i> du Kivi et de l'Ituri" ..	120
GOLDOSVIL, A. M., and PODOLSKAIA, M. Z. .. "A Small Cage for Insect Vectors used in Plant Inoculations" ..	44
GONTSCHAROW, S. W., and BURWASSER, F. G. .. "The Distribution of Insects, Spiders, and Mites in the Air" ..	43
GORE, W. R. .. " <i>L'Aspergillus alliaceus</i> , Thom et Church. Isolato da Capsule di Cotone Coltivate in Sicilia" ..	123
GOULDEN, C. H. .. "Changes of Gossypol in the Process of Cottonseed Oil Extraction" ..	113
GOVAERT, —. .. "Cotton Hair: Structure" ..	70
GRACIE, D. S., and BALLS, W. L. .. "Results of Cotton Variety Tests, 1936-39" ..	97
GRACIE, D. S., and KHALIL, F. .. "Methods of Statistical Analysis" ..	109
GREATHOUSE, G. A. .. "L'Amélioration des Plantes au Congo Belge" ..	27
GRIERSON, W. A. .. "Les Effets du Sol, de la Saison et de la Fumure sur la Végétation et le Rendement du Cotonnier" ..	38
GRIMES, M. A. .. "Dibble Sowing of Cotton: Method, Effects and Profits" ..	37
GROSS, E. E. .. "The Quantity, Distribution and Composition of the Organic Matter and Available Nitrogen in Egyptian Soils" ..	25
GULATI, A. N., and AHMAD, N. .. "Alkaloids from <i>Sanguinaria canadensis</i> and their Influence on Growth of <i>Phymatotrichum omnivorum</i> " ..	126
GUSTAFSON, A. F. .. "A Review of the Textile Trade of the United States of America" ..	22
.. "Physical Characteristics in Cotton and their Inter-relationship" ..	65, 137
.. "Texas Cottons: Fibre Tests" ..	98
.. "Cotton: Land Preparation, Planting and Cultivation" ..	37
.. "The Effect of Environmental and Genetical Factors on Fibre Maturity of Cotton" ..	73
.. "Handbook of Fertilizers: Their Source, Make-up, Effects, and Use" ..	34

	PAGE
HADDON, C. B.	"Biennial Report of the North-East Louisiana Experiment Station, St. Joseph, Louisiana, 1937-38 " - 23
HALLER, —.	"Rust-red Cotton: Examination " - 78
HAMBLETON, E. J.	"A Ocorrência do Acaro Tropical <i>Tarsonemus latus</i> Banks (<i>Acar. Tarsonemidae</i>). Causador da Rusgadura das Folhas nos Algodoads de S. Paulo " - 51
	"O Percevejo <i>Horcius nobilellus</i> (Berg.) como Nova Praga do Algodoeiro em S. Paulo. Observações Preliminares " - 49
HAMBLETON, E. J., and SAUER, H. F. G.	"Brazil: Observações sobre as Pragas du Cultura Algodocira no Nordeste e Norte do Brasil " - 41
HANCOCK, H. A.	"The Cottons of Egypt " - 24
HANSFORD, C. G.	"Vascular Diseases of Cotton in Uganda " - 58
HARLAND, S. C.	"A História da Evolucao dos Algodões Cultivados do Novo Mundo " - 133
	"New Polyploids in Cotton by the Use of Colchicine " - 82
HARPER, H. J., et al.	"Fertilizing Constituents of Cotton Burs or Cotton Bur Ashes and their Effect on Crop Yields " - 34
HARRIS, K. H.	"Soil Conservation v. Insect Control " - 32
HASKELL, J. R., and BARKER, H. D.	"Cotton-seed Treatment " - 128
HELGESON, E. A.	"Growing Plants without Soil " - 129
HELLIWELL, E. H.	"Cotton: Stapling Test " - 142
	"Cotton Yarns: Diameter Measurements " - 143
HENDERSON, L. P.	"Review of Nkwele Farm Work, 1930-37 (Nigeria) " - 153
HENRARD, P.	"Le cycle vital de la Teigne du Cotonnier au Congo Belge" - 44
HENRY, P. S. H.	"Cotton Bales: Uptake of Moisture " - 111
HERINGTON, G. N.	"Education and Agriculture (Nigeria) " - 153
HESS, K.	"Cotton Hair: Development " - 70
HESS, K., et al.	"Studies on the Ontogenesis and Chemical Structure of the Vegetable (Cotton) Cell Wall " - 133
HESSLER, L. E., et al.	"Composition of Bark and Inner Part of Roots of the Cotton Plant " - 2
	- 67
HOCK, C. W., and HARRIS, M.	"Cotton Fibres: Behaviour in Cuprammonium Hydroxide Solutions " - 139
HOCKENYOS, G. L.	"Laboratory Evaluation of Soil Poisons used in Termite Control " - 51
HOLLEY, K. T., and DULIN, T. G.	"Influence of Boron on Flower-bud Development in Cotton " - 35
HOLLEY, W. C., and ARNOLD, L. E.	"Changes in Technology and Labour Requirements on Crop Production " - 22
HOLMAN, R. M., and ROBBINS, W. W.	"A Textbook of General Botany for Colleges and Universities " - 129
HOOPER, F. E.	"Disintegration of the Cell Membrane of the Cotton Fibre by a Pure Culture of Bacteria " - 72
HOPKINS, J. C. F.	"Annual Report of the Senior Plant Pathologist, Southern Rhodesia " - 90
	"A Descriptive List of Plant Diseases in Southern Rhodesia and their Control " - 123
HOSKING, H. R.	"The American Cotton Growing Industry: Some Impressions: I " - 93
HOWARD, SIR ALBERT	"An Agricultural Testament " - 106
HOWELL, L. D.	"Cotton Prices in Spot and Futures Markets " - 149
	"Seed Cotton: Marketing in U.S.A." - 23
HOWELL, L. D., and WATSON, L. J.	"Cotton Prices in Relation to Cotton Classification Service and to Quality Improvement " - 148
HUMPHREY, L. M.	"Effects of Inbreeding Cotton, with Special Reference to Staple Length and Lint Percentage " - 134
HUNT, S. B.	"Cotton Production in U.S.A." - 20
HUNTER, H.	"Shirley Institute Fading Test Equipment " - 143
HURD-KARRER, A. M.	"Relation of Sulphate to Selenium Absorption by Plants " 35
HURST, H. E., and CURRY, P. A.	"Report on the Measurement of the Quantity of Dust in the Atmosphere of Cotton Gineries " - 40

HUSAIN, M. A., and TREHAN, K. N.	"Final Report on the Scheme of Investigation on the White Fly of Cotton in the Punjab, Pt. VI "	- 122
HUTCHINSON, H. . .	"Swaziland: Insect Pests of Cotton "	- 42
HUTCHINSON, J. B.	"The Genetic Interpretation of Plant Breeding Problems "	- 130
	"The Relationship of <i>Gossypium raimondii</i> Ulb."	- 65
	"Some Problems in Applied Genetics "	- 132
HUTCHINSON, J. B., et al.	"Further Studies on the Inheritance of Leaf Shape in Asiatic <i>Gossypiums</i> "	- 65
HUTCHINSON, J. B., and SILOW, R. A.	"Gene Symbols for use in Cotton Genetics "	- 61
ISGUR, B. . .	"An Introduction to Soil Science "	- 103
ITALIENER, K. . .	"Budgetary Control in Industry: Application to the Textile Trades "	- 80
JACKS, G. V. . .	"Soils and Fertilizers "	- 106
JACKS, G. V., and SCHERBATOFF, H.	"The Minor Elements of the Soil "	- 103
JAMES, H. M., and KOUIMIDES, C. C.	"An Analysis of Farming Costs in Cyprus "	- 11
JAMESON, D. H., and SCHMIDT, C. M.	"Boron as a Plant Nutrient "	- 35
JANJUA, N. A. . .	"A Preliminary Note on the Bionomics and Control of the Black-headed Cricket (<i>Gryllulus domesticus</i> Linn.) in Usta Colony (Sibi District) of Baluchistan "	- 46
JOHNSON, A. C., et al.	"Cotton Bales: Physical Properties "	- 40
JOHNSON, A. J., and BAGGETTE, T. L.	"Air-Blast Gin Performance and Maintenance "	- 39
JOHNSON, B. . .	"Cotton Stapling Device "	- 142
JOLLEY, J. H. . .	"Australian Cotton Industry "	- 92
JOTISALIKARA, L. . .	"Cotton Cultivation in Siam "	- 30
KALAMKAR, R. J., and DHANNALAL, —	"Variability of Plant Density and the Estimation of Yield of Cotton by Sampling "	- 67
KAMII, Y.	"Japanese Industries: Changes since 1929 "	- 29
KANNAYYA, A. . .	"The Cultivation of Cambodia Cotton in the Central Districts "	- 7
KARACHI COTTON ASSOCIATION, LTD.	"Karachi Cotton Annual, 1938-39 "	- 88
KARA-MOURZA, L.	"Physiological Changes in Virus Affected Cotton "	- 59
KASPARYAN, A. S. . .	"A Colchicine-induced Amphidiploid; Upland \times Egypt- ian Cotton (<i>Gossypium hirsutum</i> L. and <i>G. barbadense</i> L.) "	- 136
KATUKI, S., and SUKEGAWA, H.	"Japanese Cotton Mills: Atmospheric Conditions "	- 101
KAWAGUCHI, S. . .	"The Cotton Industry in China "	- 27
KAWAIL, I.	"On the Results of Breeding Experiments with <i>Lygus</i> <i>lucorum</i> Mey. on Cotton and Egg-Plant "	- 50
KEARNEY, T. H., et al.	"S \times P Cotton in Comparison with Pima "	- 134
KEEN, B. A. . . .	"What Happens to the Rain ?" -	- 32
KELLEY, A. P. . .	"The Occurrence of Mycorrhizæ, Considered Systemat- ically, with Special Reference to the Extent of our Knowledge concerning Them "	- 109
KEMPANER, H. L.	"Spinning Room Humidity "	- 78
KING, C. J., and BARKER, H. D.	"An Internal Collar Rot on Cotton "	- 58
KING, C. J., and PARKER, R. B. . .	"Angular Leafspot of Cotton in Irrigated Valleys of Arizona and New Mexico "	- 54
KING, J. G. M. . .	"Mixed Farming in Northern Nigeria "	- 12
KNIGHT, H. G. . .	"The Regional Research Laboratories and Some of their Research Projects "	- 95
KNIGHT, R. L., and CLOUSTON, T. W.	"The Genetics of Blackarm Resistance. I. Factors B ₁ and B ₂ "	- 55
KOBER, P.	"Cotton Fabrics: Effect of Weave on Structure "	- 75

	PAGE
KOSTOFF, D.	"Heritable Variations Conditioned by Euploid Chromosome Alterations " - - - 62
	"The Production of Plants with New Characters by Doubling the Number of Chromosomes (Polyploidy)" 62
KRÜGER, D.	"Cotton Linters: Acetylation " - - - 75
KUWADA, Y.	"Chromosome Structure: A Critical Review " - 132
LAL, K. B.	"Identity of Two Important Parasites hitherto Considered as Distinct Species " - - - 52
LANHAM, W. B., <i>et al.</i>	"Quality of North Carolina Cotton, 1928-36 " - 23
LEECH, R., LTD.	"The Rectifinder " - - - 78
LEHMAN, S. G.	"Cotton Seed Treatment " - - - 37
LEVER, J. A. W.	"Fiji: Entomological Notes " - - - 114
LEVIN, J. H., and MARTINELL, R. A.	"Analysis of Cotton and Viscose Rayon Mixtures " - 146
LEWICKI, S.	"Some Detrimental Trends in Russian Genetics and Plant Breeding " - - - 62
L'HIVER, J.	"Neps: Causes and Prevention " - - - 142
LLANOS, V. V.	"El <i>Alabama</i> en la zona Algodonera de Armero " - 117
LOCHRIE, J. V.	"Swaziland: Work on Cotton at the Bremersdorp and Croydon Experimental Stations, 1937-38 " - 15
MACDONALD, D., FIELDING, W. L., and RUSTON, D. F.	"Experimental Methods with Cotton. II. A Study of the effects of Seed Rate and Time of Thinning on the Development and Yield of Cotton Plants in Hand-planted Cotton Trials " - - - 63
MAHER, C.	"Roads and their Relationship to Soil Conservation in Kenya " - - - 105
	"The Use of Level Contour Banks and Live or Dead Wash Stops in Erosion Control in Native Areas " - 33
	"A Visit to the United States of America to Study Soil Conservation " - - - 154
MANGHAM, S.	"Earth's Green Mantle " - - - 60
MARIE, V.	"Peru: El cultivo del Algodonero en el Valle de Cañete, en Relación con las Plagas Entomológicas, en 1939 " 42
MARTIN, F. J., <i>et al.</i>	"Agricultural Methods in Sierra Leone and their Effects on the Sterility of the Soil " - - - 154
MARTIN, V. G., and LIPSCOMB, J. N.	"The Economic Problems in the Southern States " - 93
MASON, T. G., and PHILLIS, E.	"Experiments on the Extraction of Sap from the Vacuole of the Leaf of the Cotton Plant, and their Bearing on the Osmotic Theory of Water Absorption by the Cell " - - - 68
MAUER, F. M.	"On the Origin of Cultivated Species of Cotton. A Highly Fertile Triple Hybrid (<i>G. barbadense</i> × <i>G. Thurberi</i> Tod) × <i>G. arboreum</i> " - - - 64
MAUERSBERGER, H. K.	"Cotton Fibre: Structure " - - - 140
MAYO, J. K.	"Résumé of Botanical Work carried out in the Northern Provinces (Nigeria) " - - - 152
MCCARTY, H. H.	"The Geographic Basis of American Economic Life " 96
MCCORMACK, R. B.	"Seccao de Fitopatologia. O Instituto de Pesquisas Agronomicas de Pernambuco " - - - 123
MCDONALD, J. E.	"Conditions in Texas " - - - 93
MCPHERSON, J. A.	"American Cotton Mill: Modernization " - - - 93
MEHTA, C. V.	"Cotton Growing: Trend of Development " - - 3
MELHUS, I. E., and KENT, G. C.	"Elements of Plant Pathology " - - - 52
MELOY, G. S.	"Variations in the Composition and Grade of Cotton Seed produced in the States of Alabama, Georgia, North Carolina, and South Carolina. Crop Years of 1934-35 to 1937-38 " - - - 96
MENCHIKOWSKY, F.	"Water Conditions of the Soil and Irrigation " - 31
MENDES, A. J. T.	"Duplicação do Numero de Cromosômios em Café, Algodão e Fumo, pela ação da Colchicina " - 70
METCALF, C. L., and FLINT, W. P.	"Destructive and Useful Insects " - - - 82

	PAGE
MEYER, C. A. ..	"Brazilian Cotton: Production" - - - 100
MIEGE, E. ..	"Morocco: Cotton Cultivation" - - - 102
MILES, L. E. ..	"Effect of Type and Period of Storage on Cotton Seed after Treatment with Organic Mercury Dusts" - 111
	"Some Tests of Varietal Susceptibility to a Combination of Root-knot Nematode and Cotton Wilt" - 59
MILLER, P. R., and WEINDLING, R.	"A Survey of Cotton Boll Rot Diseases in 1939 and the Micro-organisms Associated with them" - 123
MILNE, D. R., and CAMERON, F. K.	"Cotton Plant: Pulping with Chlorine" - - - 81
MILNE, G. ..	"Report on a Journey to Parts of the West Indies and the United States for the Study of Soils" - 155
	"Soil Conservation. The Research Side" - - - 105
	"Some Aspects of Modern Practice in Soil Survey" - 105
MIRCHANDANI, T. J.	"Sind: Cotton Cultivation" - - - 88
MOORE, J. H. ..	"Measuring the Diameter of the Cotton Fibre" - 71
	"The Relation of Certain Physical Fibre Properties in Improved Cotton Varieties to Spinning Quality" 71
MOORE, J. H., and ANDERSON, D. B.	"Continuously Developed Cotton Fibres. Physical Properties" - - - 65
MORIYAMA, C. ..	"A Parasite of <i>Sylepta derogata</i> Fab." - - - 53
MOROZOV, A. A. ..	"Cotton: Drying in Field of Short-wave Condenser" - 40
	"Cotton Cellulose: Fractionation by Cuprammonium Solution" - - - 138
MOROZOV, A. A., and RABKIN, M. A.	"Cotton Fibre. Strength and X-ray Structure" - 72
MORRIS, V. H., et al.	"Toxicity of Selenium-containing Plants to Pests" - 128
MULLER, H. R. A. ..	"Overzicht van de Belangrijkste Citrus-Ziekten in Nederlandsch-Indie" - - - 54
MUNRO, J. W. ..	"Note on the Entomological Work (of Experiment Stations of Corporation, 1938-39)" - - - 10
MUSSER, D. M., and NICKERSON, R. F.	"Cotton Seed Hulls: Industrial Uses" - - - 80
MUTTI, I. ..	"Staple Fibre Cotton and Cotton-Cottonized Hemp Mixture Fabrics: Resistance to Washing" - 147
NEBEL, B. R. ..	"Chromosome Structure" - - - 132
NEELY, J. W., and McNAMARA, H. C.	"Cotton Characteristics. Money Value, Staple Length, Gin Turnout" - - - 98
NEISWANDER, C. R., and MORRIS, V. H.	"Toxicity of Selenium-containing Plants to Pests" - 128
NEVSKII, V. P. ..	"Contribution to the Study of the Aphids of Central Asia" - - - 45
NEWCOMBE, H. B. ..	"A Note on the Relation of <i>Gossypium raimondii</i> Ulb. to Other American Species" - - - 135
NEWTON, R. B., et al.	"Heat-resistant Cotton Yarn and Cord. Production" 76
NICHOLAS, H. ..	"Education and Agriculture (Gold Coast)" - - - 154
NOWELL, W. ..	Editorial - - - 1
	"A Review of the Work of the Experiment Stations, Season 1938-39" - - - 10
NYE, G. W. ..	"Some Results from Bukalasa Experiment Station (Uganda), Pt. I" - - - 91
OLCOTT, H. S. ..	"Sand Culture of Cotton Plants" - - - 38
O'MARA, J. G. ..	"Observations on the Immediate Effects of Colchicine" 136
ONODERA, Z. ..	"Cotton Flower Bud Development: Influence of Day Length" - - - 64
	"Eastern Asiatic Cotton: Taxonomy" - - - 60
O'SHIELDS, W. R. ..	"North and South American Cotton Production" - 100
PAL, B. P. ..	"Genes: Atoms of Heredity" - - - 130
PALMER, J. H., and GIBBON, M. W.	"Kano Agricultural Station (Nigeria): Review of Experiments, 1925-38" - - - 153
PANSE, V. G. ..	"Hybrid Indian Cottons: Inheritance of Staple Length: Statistical Study" - - - 134
	"The Inheritance of Quantitative Characters and Plant Breeding" - - - 131

	PAGE
PARRY JONES, E. "Two Egg Parasites of the Cotton Bollworm, <i>Heliothis armigera</i> Hubn. (<i>obsoleta</i> Fabr.), in Southern Rhodesia "	53
"The Over-wintering Pupa of <i>Heliothis armigera</i> Hubn. (<i>obsoleta</i> Fabr.). I. Effect of Temperature and Moisture "	47
PARSONS, F. S. "Investigations on the Cotton Bollworm, <i>Heliothis armigera</i> Hubn. (<i>obsoleta</i> Fabr.)."	Pt. I. 46 Pt. II. 117 Pt. III. 118
PATCH, E. M. "Food-plant Catalogue of the Aphids of the World, Including the Phylloxeridæ "	45
PEIRCE, F. T., and LORD, E. "Cotton Fibre: Fineness and Maturity "	71
PELTIER, G. L., et al. "Distribution and Prevalence of Ozonium Root Rot in the Shelter-Belt Planting Area of Oklahoma "	125
PHILIP, R. W. "American Spinning Mill: Modernization "	21
"American Textile Colleges: Curricula and Enrolments "	95
PHILLIS, F., and MASON, T. G. "Further Studies on Transport in the Cotton Plant. VII. Simultaneous Changes in the Production and Distribution of Dry Matter under Varying Potassium Supply "	69
"Studies on the Partition of the Mineral Elements in the Cotton Plant "	69
PILETTE, M. "Linters: Production "	141
PINCUS, J. W. "The Genetic Front in the U.S.S.R." "	132
PINOCHET, H. M. "The Use of Aeroplanes in the Campaign against Cotton Pests "	99
PITTERY, R. "Aperçu sur l'Experimentation Culturelle à la Station de Bambesa durant la Campagne 1938-39 "	155
PITTERY, R., and ENGELBEEN, M. "Note sur l'Experimentation Cotonnière "	132
PLAUCHE, H. "American Cotton Crop, 1938-39 "	21
PLÖTZE, E., and PERSON, H. "Cotton and Ramie Fibre: Crystallite Orientation "	146
PODOLSKAIA, M. "Changes in Gossypol during Ripening and Storage of Cotton Seed "	146
PODRESCHETNIKOV, J. J., et al. "Transparent Cotton Fabrics: Production "	75
POGOSHEV, P. M. "Crease-resistant Cotton Fabrics: Production "	74
PONOMAREVA, L. M. "Tests of <i>Trichogramma evanescens</i> W. for the Control of the Cotton Bollworm (<i>Chloridea obsoleta</i> F.) "	53
POPEREKOV, M. "Apply the Theory and Methods of Work of Dr. T. D. Lysenko to Work on Flax and Cotton "	62
PRESLEY, J. T. "Unusual Features in the Behaviour of <i>Sclerotia</i> of <i>Phymatotrichum omnivorum</i> "	57
PRESTON, J. M. "Fibre Mounting Medium Section Cutting "	141
PRUTHI, H. S. "India: Report of the Imperial Entomologist "	41
PYENSON, L. "Notes on the Biology of the Cotton Pruner (<i>Chalcodermus bondari</i> Marshall) "	48
RAINWATER, C. F., and ALLEN, N. "Cotton Root Aphid: Life History "	120
RAINWATER, C. R. "Experiments using Several Insecticides with and without Wetting Agents and Stickers for Boll Weevil Control "	115
RAMIAH, R. "Plant Breeding Problems in India "	130
RANGANATHA V. N. "A Study of the Inheritance of Locular Composition in Mysore-American Cotton Fruit and its Relation to Yield "	135
RAO, K. S. "Indian Hand-loom Weaving Industry "	4
READ, J. "The Future of Technical Training and the Cotton Industry "	137
RICHARDSON, R. P. "Cotton Fibre: Effect of Length on Spinning Quality "	141
"Cotton Yarn: Quality, Factors and Testing "	145
RICHHARIA, R. H. "Plant Breeding Technique in Recent Years "	61

	PAGE
RISO, R.	" Biancavilla Cotton: Characteristics " 141
	" Cotton: Moisture Content " 146
ROARK, R. C.	" Agricultural Products as Insecticides " 40
ROBERTS, C., and JONES, J. R.	" The Growth of other Farming Industries in Georgia and South Carolina " 93
ROBERTS, E. O.	" Conidial Germination of the Cotton Root Rot Fungus " 125
RODD, A. E.	" The Cotton Worm (<i>Chloridea obsoleta</i> F.) and its Control " 47
ROEHRICH, O.	" The Staple Length of Raw Cotton: Various Conceptions and a New Method of Investigation " 142
ROGERS, R. E., et al.	" Physical and Chemical Changes produced in Bleached Cotton Duck by <i>Chaetomium globosum</i> and <i>Spirochaeta cytophaga</i> " 147
ROY, K. B.	" The Electric Eye sorts Cotton " 97
RUDOLPH, B. A., and HARRISON, G. H.	" Attempts to Control Verticillium Wilt of Cotton and Breeding for Resistance " 59
RUPRECHT, P.	" Russian Cotton Industry Development " 30
RUSSELL, SIR E. J.	" Composts " 106
	" Organic and Inorganic Manures: Their Relative Effectiveness " 107
RUSSELL, E. R.	" Primitive Farming in Nigeria: The Mumuye Tribe " 89
RUSSELL, W. W., and WOODBERRY, N. T.	" Fluidity of Cotton in Dimethyl DibenzyI Ammonium Hydroxide: Measure of Cotton Degradation " 138
RUSO, G.	" Cotton Seeds: Disinfection " 128
RUTTLE, M. L., and NEBEL, B. R.	" Cytogenetic Results with Colchicine " 136
SABET, Y.	" Cotton Root: Mycorrhizal Habit " 68
SAINT, S. J.	" Manurial Trial with Sea Island Cotton " 19
SALTER, R. M., and SCHOLLENBERGER, C. J.	" Farm Manure " 107
SALTO, I.	" World Cotton Crop: Prospects, 1939-40 " 79
SANSOME, F. W., and PHILP, J.	" Recent Advances in Genetics " 61
SARAIYA, R. G.	" Raw Cotton: Price Control " 148
SAUER, H. F. G.	" Biologia de <i>Calliephialtes dimorphus</i> Cushm. (Hym. Ichn.) um Interessante Parasita Primario de <i>Platyedra gossypiella</i> Saund. " 116
	" Inimigos naturais da <i>Platyedra gossypiella</i> Saund. no Estado di São Paulo " 44
SAUNDERS, A. R.	" Statistical Methods with Special Reference to Field Experiments " 110
SAVILLE, A. H.	" Notes on the Use of the Striding Level when Laying out Contour Banks " 34
SAVILLE, R. J., and THORNTON, S. B.	" Louisiana: Factors in the Organization and Operation of Farms in an Upland Cotton Area " 98
SAWNHEY, K.	" Cotton Growing in Hyderabad State (Vol. I.) " 6
SCHOLLENBERGER, C. J.	" Chemical Conservation of Manure " 107
SCHULER, E. A.	" Social Status and Farm Tenure. Attitudes and Social Conditions of Corn Belt and Cotton Belt Farmers " 22
SCHWARZ, E. R.	" Textile Technology: Research Problems " 143
SCOTT, W. K., and ANDERSON, J. T.	" The Balance between Farms and Factories in North Carolina " 93
SELMIM, ABDEL-GHAFFAR	" Bud-Shedding and its Relation to Pollen Development in Cotton " 68
SEN, K. R., and AHMAD, N.	" The Effect of Clinging Power of Fibres on Yarn-Strength Irregularity " 73
SHAH, D. L.	" A Note on the Prevention of the Extension of Erosion in Ravine Lands and Improvement of Fodder and Grazing in Waste and Ravine Lands " 33
SHAPIRO, L.	" Nomograms: Application " 143
SHEETS, E. W., and THOMPSON, E. H.	" Feeding Cotton " 114

	PAGE
SHEN, T. H.	"Perennial Cotton in South-Western China" - - - 28
SHIBUYA, K., <i>et al.</i>	"Cotton Plant: Nitrogen Supply" - - - 64
SIDERI, D. I.	"On the Formation of Structure in Soil" - - - 31
SILOW, R. A.	(a) "The Genetics of Leaf Shape in Diploid Cottons, and the Theory of Gene Interaction" - - - 66
	(b) "The Genetics and Taxonomic Distribution of some Specific Lint Quality Genes in Asiatic Cottons" - - - 66
SINGH, B. N., and KAPOOR, S. L.	"Delinting and Germination of Cotton Seeds as affected by $ZnCl_2 \cdot 2HCl$ Treatment" - - - 37
SISSON, W. A.	"Some Observations upon the Dispersion Electrokinetic and Coagulation Behaviour of Cotton Fibres in Cuprammonium Hydroxide Solution" - - - 73
SKINNER, THOS., AND Co. (Publishers) LTD.	"Cotton Trade Directory of the World, 1939-40" - - - 81
SMITH, E. H. G.	"Cotton Selection in Southern Nigeria" - - - 153
SMITH, F.	"Report on Nigerian Transport" - - - 12
SMITH, H. P.	"Mechanical Cotton Harvester: Factors Influencing Efficiency" - - - 112
	"Mechanical Harvesting of Cotton as affected by Varietal Characteristics and other Factors" - - - 112
	"That Cotton Revolution" - - - 112
SMITH, M. W.	"Diphenylamine Promising as Soil Poison against Sub- terranean Termites" - - - 121
SOOKNE, A. M., and HARRIS, M.	"Cotton: Acidic Properties and Cation Exchange" - - - 145
SOUTHERN TEXTILE ASSOCIATION	"Spinning Problems: Discussion" - - - 143
SQUIRE, F. A.	"The Pink Bollworm, <i>Platyedra gossypiella</i> Saund., in the West Indies" - - - 45
	"Observations on the Larval Diapause of the Pink Bollworm, <i>Platyedra gossypiella</i> Saund." - - - 115
	"Observations on Cotton Stainers in the West Indies" - - - 50
STAHLER, N.	"A Disease of the Corn Earworm, <i>Heliothis obsoleta</i> F." - - - 53
STARR CHESTER, K.	"Seed Treatments for Cotton" - - - 128
STAUDINGER, H., <i>et al.</i>	"Über Makromolekulare Verbindung. Mitteilung. Über die Zerstörung der Cellulose durch Mikroorganismen" - - - 145
STAUDINGER, H., and JURISCH, I.	"Cotton Cellulose: Degradation by Heat" - - - 137
STEINBERG, R. A.	"Growth of Fungi in Synthetic Nutrient Solutions" - - - 54
STEPANTZEV, I. N.	"The Meteorological Régime of the Cotton Aphids and their Distribution in Uzbekistan" - - - 45
STEPHENS, S. G.	"Colchicine Treatment as a Means of Inducing Polyploidy in Cotton" - - - 69
STEVENS, N. E.	"Departures from Ordinary Methods in Controlling Plant Diseases" - - - 54
STEWART, H. R.	"The Punjab as a Producer of Staple Cottons" - - - 8
STOCKDALE, SIR FRANK	"The Application of Economic Botany in the Tropics" - - - 60
STOREY, H. H.	"Soil Conservation in the Tropics" - - - 31
	"Investigations of the Mechanism of the Transmission of Plant Viruses by Insect Vectors. III. The Insect's Saliva" - - - 126
	"Virus Diseases of Plants" - - - 59
STORIE, R. E.	"A Comprehensive Legend for Soil Maps" - - - 32
STRONG, L. A.	"United States: Report of the Chief of the Bureau of Entomology and Plant Quarantine," 1938 - - - 43
	1939 - - - 114
SVENSSON, R.	"A Handbook of Malaria Control" - - - 151
TARANOVSKAIA, M. G., and GORIEN- SKII, M. M.	"Cultivation of Cotton on Complex Solonetz Soils" - - - 104
TAVARES, H.	"O Índice de Oleo nas Selecoes do Algodão" - - - 135
THARP, W. H., and WADLEIGH, C. H.	"The Effects of Nitrogen Source, Nitrogen Level, and Relative Acidity on Fusarium Wilt of Cotton" - - - 127
THAYSEN, A. C., <i>et al.</i>	"The Effect of Climatic Exposure on Textile Fibres and Fabrics" - - - 74

		PAGE
THIMANN, H. V. ..	"Hormones and the Analysis of Growth" ..	129
THOMAS, K. M. ..	"Report of the Government Mycologist, Madras, 1938-39"	122
TIMSON, S. D. ..	"Compost" ..	36
	"Compost Notes" ..	36
TINCKER, M. A., and UNWIN, C. H.	"A Further Report on Root-Forming Substances used for Propagation Purposes" ..	82
TOBLER, L. A. ..	"The Presence of Resins in the Kernel of Cotton Seeds" ..	111
TODD, J. A. ..	"Cotton Statistics" ..	79, 149
TOY, F. C. ..	"The Influence of Science on the Cotton Industry" ..	81
TRICE, M. F. ..	"Low Grade American Cotton Carding: Dust Hazard" ..	95
TROTMAN, A. E. ..	"Ishan Cottonseed Multiplication (Nigeria)" ..	152
TRUOG, E. ..	"A Modern Conception of Soils, Fertilizer Action, and Plant Nutrition" ..	32
TUCKER, R. W. E.	"Cotton Growing and Cotton Pests Control" ..	19
TURGAY, S. N. ..	"La Question Cotonnière en Turquie" ..	103
TURRILL, W. B. ..	"Genetics in Relation to Evolution and Systematics at the Seventh International Genetical Congress, Edinburgh, 1939" ..	130
ULLSTRUP, A. J. ..	"The Occurrence of the Perfect Stage of <i>Rhizoctonia solani</i> in Plantings of Diseased Cotton Seedlings" ..	58
ULLYETT, G. C. ..	"South Africa: The Encouragement of Beneficial Insects" ..	42
UNION CASTLE MAIL STEAMSHIP CO., LTD.	"The South and East African Year Book and Guide for 1940" ..	15
USPENSKII, F. M. ..	"Contribution to the Bioecology of the Spider Mite" ..	121
VASSER, R. E. ..	"L'Influence de la Température et de l'Humidité de l'Air sur le Développement du <i>Tétranyche</i> du Coton" ..	50
VASUDEVA, R. S., and ASHRAF, M.	"Studies on the Root Rot Disease of Cotton in the Punjab. VII. Further Investigations of Factors influencing Incidence of the Disease" ..	56
VAILOV, N. I. ..	"Significance of Distant Hybridization in Breeding and Evolution" ..	64
VERGÉS, U. A. ..	"Cotton Bale Coverings (Argentina): Application and Advantages" ..	99
VICTOR RING TRAVELER Co.	"Pima Cotton Yarns: Spinning" ..	77
VIEGAS, A. P. ..	" <i>Empusa dysderci</i> n.sp., um Nuovo Parassita de <i>Dysdercus</i> " ..	50
VIJAYARAGHAVAN, C., and PANDURANGA RAO, V.	"The Main Cause of Crop Failure in the Black Soil Tract of the Bellary District" ..	8
VIKTOREV, P. P., et al.	"Effect of Natural Admixtures in Cellulose on the Drying Properties of Cotton Fibre" ..	141
VON CSIKY, J. ..	"American Cotton Bales: Improvement" ..	21
WAD, Y. D. ..	"Development of Modern Composting Methods" ..	36
	"Soil Erosion and its Control in Central India and Rajputana" ..	33
WADDINGTON, C. H.	"An Introduction to Modern Genetics" ..	130
WADE, F. B., and CAWLEY, A.	"Two Levelling Instruments" ..	33
WADLEIGH, C. H. ..	"The Influence of Varying Cation Proportions upon the Growth of Young Cotton Plants" ..	134
WADLEIGH, C. H., and SHIVE, J. W.	"A Microchemical Study of the Effects of Boron Deficiency in Cotton Seedlings" ..	35
WAELEKENS, M. ..	"Quelques Analyses de Coton-Graines de la Région Nord, Campagne 1937-8" ..	156
WALLACE, H. A. ..	"The Cotton Programme" ..	93
WALLACE, J. R. ..	"American Cotton Prices, 1930-39" ..	94
WALTER, E. V., and LA HUE, D. W.	"Notes on Food for Corn Earworm Adults" ..	47
WARD, A. L. ..	"The Multiple Uses of Cotton and its Derivatives" ..	99
WASSON, R. A. ..	"One-Variety Cotton Improvement Associations" ..	96

	PAGE
WATKINS, G. M., and WATKINS, M. O.	"The Pathogenic Action of <i>Phymatotrichum omnivorum</i> " 56
WEBSTER, C. C. ..	"Experiments on the Maintenance of Soil Fertility by Green Manuring (Nigeria)" - - - 153
WELLENSIEK, S. J.	"The Newest Fad, Colchicine, and its Origin" - - - 69
WERGIN, W. ..	"Cotton Hair: Structure" - - - 70
WHISTLER, R. L., et al.	"Cotton Fibre Pectic Substance: Composition and Relation to Fibre Properties" - - - 139
WHITE, B. S., JNR.	"The Shrinking Foreign Market for United States Cotton" - - - 94
WIERNBERGER, J.	"Cotton Yarns: Strength" - - - 76
WILD, L. ..	"Cotton Opening and Cleaning Machine" - - - 77
WILDS, G. J. ..	"The Encouragement of 'One-Variety' Communities" - 93
WILLCOCKS, F. C., and BAHGAT, S.	"Egypt: Insects and Mites injurious to the Cotton Plant" - - - 41
WILLE, J. E. ..	"Informes del Departamento de Entomologia de la Estacion Experimental Agricola de la Molina" - 120
WILLIS, J. C. ..	"The Course of Evolution by Differentiation or Diver- gent Mutation rather than by Selection" - - - 151
	"How Plants have Found their Homes, I. and II." - 129
WILSON, J. P. ..	"Alabama: The Effects of 'Digging' and 'Hogging' Peanuts on Cotton Yields" - - - 96
WISHART, J. ..	"Field Trials: Their Lay-out and Statistical Analysis" - 36
WRIGHT, E. ..	"First Progress Report on the <i>Phymatotrichum</i> Root Rot Losses in Experimental Windbreaks of Oklahoma and Texas" - - - 124
WRIGHT, J. W. ..	"Marketing Practices in Producers' Local Cotton Markets" - - - 22
WRIGHT, J. W., and SMITH, G. R.	"North Carolina: Cotton Marketing in the Coastal Plain Area" - - - 98
YU, C. P.	"The Inheritance and Linkage Relations of Curly Leaf and Virescent Bud, Two Mutants in Asiatic Cotton" 67
	"The Inheritance and Linkage Relations of Yellow Seedling, a Lethal Gene in Asiatic Cotton" - - - 67
ZHEBRAK, A. R., and RZAEV, M. M.	"Mass Production of Amphidiploids by Colchicine Treatment in Cotton" - - - 136

GENERAL INDEX TO VOL. XVII.

AFGHANISTAN, 99

"Agricultural Products as Insecticides" (Roark), 40

Agricultural statistics, U.S.A., 1939, 95

"An Agricultural Testament" (Howard), 106

ALABAMA. See AMERICA.

AMERICA:

Agricultural statistics, 1939, 95;
 "Changes in Technology and Labour Requirements in Crop Production" (Holley and Arnold), 22; "Cotton: Land Preparation, Planting and Cultivation" (Gross), 37; Cotton Mixings: Blending of staples for strength, 75; "Cotton Production in U.S.A." (Hunt), 20; diseases in, 54, 57, 58, 59, 97, 123, 124, 125, 127, 156; fertilizer experiments, 109; Field Crops Research in the Bureau of Plant Industry, U.S.A., 23; "The Geographic Basis of American Economic Life" (McCarty), 96; Government Cellulose Research Laboratories: Organization, 95; "Marketing Practices in Producers' Local Cotton Markets" (Wright), 22; new uses for cotton, 150; "North and South American Cotton Production" (O'Shields), 100; "One-Variety Cotton Improvement Associations" (Wasson), 96; parasites, 48, 53; pests in, 44, 45, 47, 48, 49, 52, 82, 99, 114, 115, 120; Pima and S×P cottons: revised grade standards, 94; prices, 148; raw cotton consumption in U.S.A., 21; "Regional Research Laboratories and some of their research projects" (Knight), 95; Rpt. of Chief of Bureau of Entomology and Plant Quarantine, 1938, 43; 1939, 114; "Review of the Textile Trade of the U.S." (Grierson), 22; "Seed: Variations in the Composition and Grade of produced in Various Cotton States, 1934-35 to 1937-38" (MeLOY), 96; "Seed Cotton: Marketing in U.S.A." (Howell), 23; "Seed Treatment" (Miles), 111; "Social Status and Farm Tenure: Attitudes and Social Conditions of Corn Belt and Cotton Belt Farmers" (Schuler), 22; soil conservation, 155; soil problems, 109; spinning problems, 143; "Textile Colleges: Curricula and Enrolments" (Philip), 95; varieties of cotton in, 59, 72, 94, 96, 97, 98, 111, 134, 137; "Varieties of Cotton (Improved): Registration

of" (Brown), 133. *Alabama*: "The Effect of 'Digging' and 'Hogging' Peanuts on Cotton Yields" (Wilson), 96. *Arizona*: diseases in, 54, 58; pests in (Cassidy and Barber), 43; "Weather in Relation to Yield of American-Egyptian Cotton" (Fulton), 96. *Arkansas*: Agronomic research in 1938-39, 96; "Effects of Inbreeding Cotton, with Special Reference to Staple Length and Lint Percentage" (Humphrey), 134; "Electric Eye sorts Cotton" (Roy), 97; field crops experiments, 1938, 23. *Georgia*: Agricultural Experiment Station: work in, 1938-39, 97; cotton experiments, 1938-39, 97; field crops research at the Coastal Plain Station, 1937, 23; "Results of Cotton Variety Tests, 1936-39" (Gore), 97. *Louisiana*: Biennial Rpt. of N.E. Louisiana Exp. Station, 1937-38" (Haddon), 23; "Cotton Varieties recommended for" (Brown *et al.*), 97; "Factors in the Organization and Operation of Farms in an Upland Cotton Area" (Saville and Thornton), 98; pests in, 43, 49; Southern Regional Res. Lab., New Orleans, 97. *Mississippi*: "Diseases in" (Miles) 59, 111; farm crops studies, 98; seed treatment, 111. *New Mexico*, 54. *North Carolina*: "Cotton Marketing in the Coastal Plain Area" (Wright and Smith), 98; diseases in 1938, 54; "Experiments on Cotton Fibres" (Berkley), 138; "Insects of" (Brimley), 44; "Quality of Cotton, 1928-36" (Lanham *et al.*), 23. *Oklahoma*: "Cotton Variety Tests, 1939" (Dunlavy *et al.*), 98. *South Carolina*: pests in, 115. *Texas*: diseases in, 124, 125; "Fibre Tests" (Grimes), 98; pests in, 52.

American cotton: Grade, staple length and tenderability of, 1938-39, 94; "Low Grade American Cotton: Carding: Dust Hazard" (Trice), 95; "Prices, 1930-39" (Wallace), 94; "Production," Titles of a series of articles by various authors, 93; "Shrinking Cotton Market for U.S. Cotton" (White), 94.

"American Cotton Bales: Improvement" (von Csiky), 21

"American 26-Chromosome and Asiatic 13-Chromosome Species of *Gossypium*" (Beasley), 133

"American Cotton Crop, 1938-39" (Plauche), 21

American Cotton Futures Contract: approved changes in, 21

"American Cotton Ginnery: Improvement" (Cobb), 21

"American Cotton Growing Industry: Some Impressions" I. (Hosking), 93
American cotton and Indian textile industry, 4

"American Cotton Mill: Modernization" (McPherson), 93; "Reorganization" (American Spinning Co.), 94

American Cotton Spinning and Manufg. Industry: output, 1939, 94; "American Spinning Mill: Modernization" (Philip), 21

ANTIGUA. See WEST INDIES

"The Application of Economic Botany in the Tropics" (Stockdale), 60

ARGENTINA:

"Boletín Mensual," Nos. 59-62, 99;

"Cotton Bale Coverings: Application and Advantages" (Vergés), 99; cotton crop, 1938-39, 26; "Cotton Industry Expansion" (Ashmore), 99; pests in, 48

ARIZONA. See AMERICA

ARKANSAS. See AMERICA

Asiatic cottons: "Genetics and Taxonomic Distribution of some Specific Lint Quality Genes in" (Silow), 66; "The Inheritance and Linkage Relations of Curly Leaf and Virescent Bud: Two Mutants in" (Yu), 67; "The Inheritance and Linkage Relations of Yellow Seedling: A Lethal Gene in" (Yu), 67

"Asiatic *Gossypiums*: Further Studies on the Inheritance of Leaf Shape in" (Hutchinson *et al.*), 65

"Australian Cotton Industry" (Jolley), 92

BALUCHISTAN, 46

BARBADOS. See WEST INDIES

BARODA. See INDIA

BELGIAN CONGO: "Aperçu sur l'expérimentation culturale à la station de Bambesa durant la campagne, 1938-39." Pts. I and II (Pittery), 155; diseases in, 26, 27, 53, 58; "Note sur l'expérimentation cotonnière" (Pittery and Engelbeen), 132; pests in, 26, 44, 120; "Quelques analyses de coton-graines de la Région Nord, 1937-38" (Waelkens), 156; "Rpt. ann. de l'INEAC pour l'exercice, 1938," Pt. I, 26; selection work in, 27

"Belgian Textile Industry: Distribution and Magnitude" (Bertrand), 26

"The Biology of Crossing over" (Darlington), 129

BOMBAY. See INDIA

Boron in agriculture: (Jameson and Schmidt), 35; (Wadleigh and Shive), 35; (Holley and Dulin), 35

"Botany (General): A Textbook for Colleges and Schools" (Holman and Robbins), 129

BRAZIL:

Cotton bale coverings, 99; cotton bands for bales, 100; cotton exports, 1939, 100; "Cotton Industry" (Ashmore), 27; "Cotton Production" (Meyer), 100; "A Cultura do Algodoeiro e a Técnica do Aproveitamento da sua Produção" (Chavirin), 110; diseases, 57, 123; "Escola de Agronomia do Nordeste. Serviço de Melhoramento do Algodão na Paraíba" (de Oliveira Faria), 100; "Experiments with Colchicine on Coffee and Cotton" (Mendes), 70; "A História da Evolução dos Algodões Cultivados do Novo Mundo" (Harland), 133; "The Oil Index in Cotton Selections" (Tavares), 135; parasites in, 50, 116; pests in, 41, 44, 48, 49, 50, 51, 116; varieties of cotton, 100, 101

British Cotton Growing Association, 35th Ann. Rpt. to December 31, 1939, 88

British Cotton Industry Research Association: Electrical resistance type moisture content determination apparatus, 144; Shirley Institute fading test equipment, 143; Shirley moisture meter, 78

"Budgetary Control in Industry: Application to the Textile Trades" (Italiener), 80

BULGARIA, 100

BURMA, 41, 88

CALIFORNIA, 53, 59, 93

"Cellulose Orientation: Strength and Cell Wall Development of Cotton Fibres" (Berkley), 138

CEYLON, 9, 10

Chandler bundle method, 65, 141

CHINA, 27, 28, 67, 101

"Chromosome Structure" (Nebel), 132;

"A Critical Review of" (Kuwada), 132

Colchicine: Experiments with (Amin), 136; (Harland), 82; (Kasparyan), 136; (Mendes), 70; (O'Mara), 136; (Ruttle and Nebel), 136; (Stephens), 69; (Wellensiek), 69; (Zhebrak and Rzaev), 136

COLOMBIA, 117, 126

Composts: (Russell), 106; (Timson), 36;

"Composting Methods (Modern): Development of" (Wad), 36; "Composts and Soil Fertility" (Acharya), 107; compost trials in Southern Rhodesia, 90; "Composting Waste Materials: Comparison of Different Methods" (Acharya), 36

Cotton: "Acidic Properties and Cotton Exchange" (Sookne and Harris), 145; "Algumas Questões Técnicas sobre a Biologia e Fisiologia do Algodoeiro" (Chavirin), 130; artificial light:

- employment of for cotton classification, 99; "Bud Shedding and its Relation to Pollen Development in Cotton" (Abdel-Ghaffir Selim), 68; "Drying in Field of Short Wave Condenser" (Morozov), 40; "Effect of Calcium Arsenate upon the Yield of Cotton on Different Soil Types" (Dorman and Coleman), 108; "The Effect of Environmental and Genetical Factors on Fibre Maturity of Cotton" (Gulati and Ahmad), 73; "Effects of Inbreeding Cotton with special reference to Staple Length and Lint Percentage" (Humphrey), 134; "The Effect of Storage at Different Relative Humidities on the Strength and Colour of Cotton" (Ahmad and Gulati), 74; "Les Effets du sol, de la saison et de la fumure sur la végétation et le rendement du cotonnier" (Gracie), 38; "Experimental Methods with. II. A Study of the Effects of Seed Rate and Time of Thinning on the Development and Yield of Cotton Plants in Hand-Planted Cotton Trials" (MacDonald *et al.*), 63; "Fluidity of Cotton in Dimethyl Dibenzyl Ammonium Hydroxide: Measure of Cotton Degradation" (Russell and Woodberry), 138; increased yields with ceresan treatment, 109; "Land Preparation, Planting and Cultivation in U.S.A." (Gross), 37; "Moisture Content" (Riso), 146; "The Multiple Uses of, and its Derivatives" (Ward), 99; "On the Origin of Cultivated Species of Cotton: A Highly Fertile Triple Hybrid (*G. barbadense* \times *G. Thurberi*) \times *G. arboreum*" (Mauer), 64; "Physical Characteristics and their Inter-relationship" (Grimes), 65, 137; "From Raw Material to Finished Product," 79; "Significance of Distant Hybridization in Breeding and Evolution" (Vavilov), 64; "Stapling Device for" (Johnson), 142; "Stapling Test" (Helliwell), 142
- "Cotton (Damaged), Examination by Congo Red Test: Further Developments and Applications" (Clegg), 144
- Cotton: new uses for, 150, 151
- Cotton bales, 40, 111; cotton bale coverings, 99; cotton bands for bales, 100
- Cotton bolls: "Internal Temperature of" (Anderson), 132
- "Cotton Building Insulation Material: Application" (Forwood), 80
- Cotton cellulose, 137, 138
- Cotton duck (bleached), 147
- Cotton fabrics. See Fabrics (Cotton)
- Cotton fibres. See Fibres (Cotton)
- "Cotton and Staple Fibres: The Effect of Clinging Power of, on Yarn Strength Irregularity" (Son and Ahmad), 73
- "Cotton Flower Buds Development: Influence of Day Length" (Onodera), 64
- Cotton ginning. See Ginning of Cotton
- Cotton ginneries. See Ginneries
- Cotton Hair: "Development" (Hess), 70; "Structure" (Gontscharow and Burwasser), 70; "Structure" (Wergin), 70
- "Cotton Handbook with Related Data," 149
- "Cotton Industry: Influence of Science on" (Toy), 81
- "Cotton Linters, Acetylation" (Krüger), 75; "Production" (Pilette), 141
- Cotton mixings: Blending of staples for strength (in U.S.A.), 75
- Cotton plant: "Carbohydrates of under Different Seasonal Conditions and Fertilizer Treatment" (Ergle *et al.*), 67; "Composition of Bark and Inner Part of Roots of" (Hessler *et al.*), 67; "Nitrogen Supply" (Shibuya *et al.*), 64; "Pulping with Chlorine" (Milne and Cameron), 81
- "Cotton Plants (Young), The Influence of Varying Cation Proportions upon the Growth" (Wadleigh), 134
- Cotton prices. See Prices
- "Cotton Root: Mycorrhizal Habit" (Sabet), 68
- Cotton seed. See Seed
- Cotton varieties. See Varieties of Cotton
- Cotton yarns: Diameter measurements (Helliwell), 143; "Empirical Relationships between Count, Twist and Strength of" (Ahmad and Venkataraman), 76; "Quality; Factors and Testing" (Richardson), 145; "Strength" (Wiernsberger), 76; twist, staple length and behaviour in weaving, 76; "Über Makromolekulare Verbindungen. Mitteilung" (Staudinger *et al.*), 145
- Cotton yarns (coarse), spinning and doubling (Draper), 77; cotton yarn and cord, heat-resistant (Newton *et al.*), 76
- Cotton and ramie fibres, 146
- Cotton and viscose rayon mixtures, analysis of, 146
- Cottonseed by-products, 40; cottonseed hulls, 80; cottonseed oil, 113; cottonseed products, 114; cottonseed treatment, 37
- "The Course of Evolution by Differentiation or Divergent Mutation rather than by Selection" (Willis), 151
- CYPRUS, 9, 10, 11
- Cytology (cotton), 62, 63
- "Delinting and Germination of Cotton Seeds" (Singh and Kapoor), 37
- "Dibble-sowing of cotton" (Gracie and Balls), 37
- Diseases: "A Disease of the Corn Earworm, in California" (Stahler), 53; diseases in N. Carolina, 1938, 54; "Effect of Sulphuric Acid Treatment

of Fungi and Bacteria Present in Cotton Seed from Diseased Bolls" (Bain), 55; "Growth of Fungi in Synthetic Nutrient Solutions" (Steinberg), 54; "List of Diseases in S. Rhodesia and their Control" (Hopkins), 123; "Plant Pathology: Progress Reports on," 58; Rpt. of Govt. Mycologist, Madras, 1938-39, 122; "Soil Fungi and Root Infection: A Review" (Burgess), 54; "Some Recent Investigations on Epidemic Plant Diseases" (Brooks), 122; "A Survey of the most Important Citrus Diseases in the Dutch East Indies" (Muller), 54. *Alternaria*, 123. *A. macrospora*, 53. *Angular leafspot*, 54. *Anthraxnose*, 54, 97, 128. *Areolate mildew*, 124. *Aspergillus*, 123. *A. alliaceus*, 123. *A. niger*, 125. *Bacterium malvacearum*. See Black-arm. *Blackarm*: "Genetics and Resistance" (Knight and Clouston), 55; America, 54, 124; Uganda, 59, 154. *Boll rot*, 123. *Chetomium globosum*, 147. *Colletotrichum gossypii* (var. *cephalosporioides*, 57. *C. (Glomerella) gossypii*, 57. *C. indicum*, 122. *Damping-off*, 124. *Diplodia natalensis*, 55. *Elegans*, 58. *Empusa grylli*, 122. *F. sp.*, 54. *Fusarium lysopersici*, 124. *F. moniliforme (Gibberella fujikuroi)*, 54, 55, 123, 124. *F. oxysporum*, 55. *F. rasilsectum*. See Wilt. *Glomerella gossypii*, 54, 57, 123, 124. *Hormodendrum cladosporioides*, 125. *Internal boll disease*: Belgian Congo, 87; Nyasaland, 13; Tanganyika, 114. *Internal collar rot n.sp.*, 58. *Leaf curl*, 91. *Leaf rust (Cerotelium desmum)*, 123. *Mildew*, 55. *Nematospores*: mention omitted in "Destructive and Useful Insects" (Metcalf and Flint), 82; Brazil, 123; *N. coryli*; Belgian Congo, 53; Dutch East Indies, 54; S. Rhodesia, 90. *N. gossypii*, 53. *Penicillium*, 123. *P. luteum*, 125. *Phymatotrichum omnivorum*. See Root Rot. *Pythium*, 54. *Ramulosis*, 57. *Red leaf*, 8, 124. *Rhizoctonia bataticola (Macrophomina phaseoli)*, 56. *R. (corticium) solani*: "Occurrence of the Perfect Stage in Plantings of Diseased Cotton Seedlings" (Ullstrup), 58; in America, 54; Belgian Congo, 53; India, 56. *Rhizopus nigricans*, 123, 125. *Root knot (Heterodera marioni)*, 59, 124. *Root rot (Phymatotrichum omnivorum)*: "The Pathogenic Action of" (Watkins), 56; "Unusual Features in the Behaviour of Sclerotia of *P. omnivorum* (Presley)," 57; Root rot in America, 57, 124, 125; Brazil, 124; India, 86; Studies on in Punjab, VII (Vasudeva and Ashraf), 56. *Sclerotium rolfii*, 124, 125. *Sordaria*, 55. *Sore shin*, 124. *Southern blight*.

See *Sclerotium rolfii*. *Spirochaeta cytophaga*, 147. *Stem-breaking disease*, 58. *Stenosis*, 126. *Stigmatomycosis*, 26, 53. *Thielaviopsis basicola*, 58. *Vascular diseases*, 58. *Verticillium*. *V. dahliae*. See Wilt. *Virus diseases*, 59, 126. *Wilt*: "Effects of Nitrogen Source, Nitrogen Level and Relative Acidity on Fusarium Wilt of Cotton" (Tharp and Wadleigh), 127; "Fertilizers in Relation to Incidence of as affecting a Resistant and a Susceptible Variety of Cotton" (Dick), 127; "Studies on" (Brixhe), 58, 127; Wilt in America, 59, 97, 124, 156; Belgian Congo, 26, 53, 58, 127; Brazil, 124; California, 59; India, 56, 86; Peru, 30, 127; Uganda, 59, 154.

Drying seed cotton (Gerdes *et al.*), 38

DUTCH EAST INDIES, 54

"Earth's Green Mantle" (Mangham), 60
"Eastern Asiatic Cotton: Taxonomy" (Onodera), 60

Editorial, 1

EGYPT:

Economic conditions, 24; pests in (Willcocks and Bahgat), 41; review of 1938-39 cotton season (Barber), 24; tax on raw cotton exports reimposed, 98; varieties of cotton, 24, 25

Egyptian cotton: British Govt. purchase Egyptian cotton crop, 1940, 99; "The Cottons of Egypt" (Hancock), 24; varieties of cotton, 24, 25

Egyptian Cotton Year Book, 1938-39, 25
Egyptian soils: "The Quantity, Distribution and Composition of the Organic Matter and Available Nitrogen in" (Gracie and Khalil), 25

Egyptian Textiles: History (Gallotti), 25

Electric eye sorts cotton (Roy), 97

Electrical resistance type moisture content determination apparatus, 144

Empire Cotton Growing Corporation: assistance rendered in Nyasaland, 13; South Africa, 14, 15

Fabrics (cotton), 74, 75; use of in road construction, 151

Fertilizers: "Commercial Fertilizers: Their Sources and Use" (Collings), 108; cotton for fertilizer bags (Cheatham and Evans), 150; "Chemical Conservation of Manure" (Schollenberger), 107; "Dynamics of the Mobile Forms of Nitrogen in the Soil and Agrochemical Control in Cotton Plantations" (Baliabo), 109; "The Effect of Calcium Arsenate upon the Yield of Cotton on Different Soil Types" (Dorman and Coleman), 108; "The Effect of Nitrogen, Phosphorus and Potassium in Fertilizers on the Earliness of Cotton" (Brown and Pope), 34; "The Effect of Various Nitrogenous Fertilizers

- on Soil Factors affecting the Yield of Crops" (Davies), 108; "Farm Manure" (Salter and Schollenberger), 107; "Fertilizer Materials and Mixed Fertilizers" (Blair), 108; "Handbook of" (Gustafson), 34; "Organic and Inorganic Manures: Their Relative Effectiveness" (Russell), 107
- Fertilizing constituents of cotton burs or cotton bur ashes and their effect on crop yields (Harper *et al.*), 34
- Fibres (Cotton): Apparatus for measurement (Johnson), 71; "Behaviour in Cuprammonium Hydroxide Solutions" (Hock and Harris), 139; "Behaviour of Cell Membrane in Cuprammonium Hydroxide Solutions" (Farr), 72; "Cellulose Orientation" (Berkley), 138; "Continuously Developed: Physical Properties of" (Moore and Anderson), 65; "Disintegration of the Cell Membrane by a Pure Culture of Bacteria" (Hooper), 72; "Effect of Length on Spinning Quality" (Richardson), 141; "Effect of Natural Admixtures in Cellulose on Drying Properties of" (Viktorov *et al.*), 141; "Fineness and Maturity" (Peirce and Lord), 71; "Measuring Diameter of" (Moore), 71; "Pectic Substance" (Whistler *et al.*), 140; "Some Observations on the Dispersion, Electrokinetic and Coagulation Behaviour of in Cuprammonium Hydroxide Solution" (Sisson), 73; "Strength and X-ray Structure" (Morozov and Rabkin), 72; "Structure" (Barrows), 139; (Mauersberger), 139; "Studies on the Development of" I (Compton and Haver), 138; "X-ray Structure and Strength at Different Stages of Growth" (Berkley), 140
- Fibre mounting medium section cutting (Preston), 141
- Field Trials: Their lay-out and statistical analysis (Wishart), 36
- FIJI, 9, 17, 114
- FRENCH EQUATORIAL AFRICA, 101
- "Genes: Atoms of Heredity" (Pal), 130; "Gene Symbols for Use in Cotton Genetics" (Hutchinson and Silow), 61
- Genetics: "Genetics of Blackarm Resistance" (Knight and Clouston), 55; "Genetics of Leaf Shape in Diploid Cottons, etc." (Silow), 66; "Genetics of a Petaloid Mutant in Cotton" (Afzal and Singh), 62; Genetics and Taxonomic Distribution of some Specific Lint Quality Genes in Asiatic Cottons" (Silow), 66; "Recent Advances in" (Sansome and Philip), 61; "Relation of to Evolution and Systematics" (Turrill), 130; "Some Detrimental Trends in Russian Genetics and Plant Breeding" (Lewicki), 62
- The genetic front in U.S.S.R. (Pincus), 132; "The Genetic Interpretation of Plant Breeding Problems" (Hutchinson), 130; "Genetics (Applied), some Problems in" (Hutchinson), 132; "Genetics (Modern): An Introduction to" (Waddington), 130
- GEORGIA. See AMERICA
- Ginning of cotton: (Bennet and Gerdes), 112; (Gerdes *et al.*), 112
- Gins (air blast), 39; gin damage to cotton (Gerdes and Bennett), 39
- Ginneries: Sudan, 91; Uganda, 16; W. Indies, 18; "Rpt. on Measurement of the Quantity of Dust in the Atmosphere of" (Hurst and Curry), 40
- GOLD COAST, 154
- "*Gossypium raimondii*: A note on the relation of to other American Species" (Newcombe), 135
- GREECE, 28, 110
- GRENADA. See WEST INDIES
- "Growing Plants without Soil" (Helgeson), 129
- Hardy device, 65
- Harvesting machinery. See Picking Machinery
- "Heritable Variations conditioned by Euploid Chromosome Alterations" (Kostoff), 62
- HONDURAS, 88
- "Hormones and the Analysis of Growth" (Thimann), 129
- "How Plants have found their Homes" I, II (Willis), 129
- "Hybrid Indian Cottons: Inheritance of staple length" (Pansel), 134
- "Hybridization of American 26-chromosome and Asiatic 13-chromosome species of *Gossypium*" (Beasley), 133; "Hybridization (Distant): Significance of in Breeding and Evolution" (Vavilov), 64; "Hybridization (Inter-specific) between Asiatic and New World Cottons" (Amin), 134
- HYDERABAD. See INDIA
- Imperial College of Tropical Agr., Trinidad, Ann. Rpt. for 1938-39, 18
- Imperial Institute Ann. Rpt., 1939, 10
- "Incomplete Randomized Block Experiments" (Cornish), 110
- INDIA:
- "Agriculture and Animal Husbandry in 1937-38," 85; costs of production, 4; "Cotton Growing: Trend of Development" (Mehta), 3; diseases, 56, 58; Imperial Coun. of Agr. Res., Rpt. for 1938-39, 4; "Impressions of Cotton Growing in" (Crowther), 3; List of Cotton Pressing Factories, 1939-40, 85; parasites, 52, 121; pests, 7, 41, 52, 82, 115, 121, 122; "Plant Breeding Problems in" (Ramiah), 130; "Plant Breeding Technique in Recent Years" (Richharia), 61; "Progress of Agr,

- Science in during Past Twenty-Five Years" (Burns), 3; Sci. Rpts. of Imp. Agr. Res. Inst., 1938-39, 85; varieties of cotton, 8, 74, 81, 86, 87. *Baroda*, 6; *Bombay*: "Cotton Annual No. 20, 1938-39," 6; cotton breeding at Surat, 87; Final Rpt. of Bombay Cotton Forecast Scheme, 1934-39, 86. *Hyderabad*, 6. *Madras*, 7, 8, 87, 111; Rpt. of Govt. Mycologist, 1938-39, 122. *Mysore*, 8. *Punjab*, 8, 81. *Sind*, 8, 88. *United Provinces*, 9
- Indian cottons: "Effect of Fibre-Weight per inch on Spinning Quality" (Ahmad), 73; "Empirical Relationship between Count, Twist and Strength of Cotton Yarns" (Ahmad and Venkataraman), 76; "Hair Weight and Spinning Quality" (Ahmad), 5; "Manufacturing Industry: Recent Development," 3; "Marketing" (Bramble), 3; Rev. of 1938-39 season (Chunilal Mehta and Co.), 3; spinning tests rpts., 1938-39, 5; 1939-40, 86; staple length of 1939-40 crops, 85; statistical leaflets, 1938-39, 5; technological rpts., 1938-39, 6; 1939-40, 86; varieties of cotton, 5, 6, 7, 8, 9
- Indian Central Cotton Committee: Ann. Rpt., 1939, 85; 40th meeting, 4; 41st meeting, 86; cold-weather meeting, 1940, 5; Rpt. of Tech. Laboratory, 1938-39, 5
- "Indian Farming," new publication, 4
- Indian hand-loom industry, 4, 86
- Indian textile industry and American cotton 4
- Indore Institute of Plant Industry, 73, 81, 85
- "Inheritance of Locular Composition in Mysore-American Cotton Fruit and its Relation to Yield" (Ranganatha Rao), 135; "Inheritance of Quantitative Characters and Plant Breeding" (Panse), 131
- Insects. See Pests
- IRAN, 44, 115
- ITALY, 29, 101
- JAPAN, 29, 42, 53, 101; "Japanese Industries: Changes since 1929" (Kamii), 29
- JAVA, 42
- Karachi Cotton Annual, 1938-39, 88; Karachi Cotton Assn., Ltd., 88
- KENYA, 9, 11, 105, 155
- LOUISIANA. See AMERICA
- Machinery: opening and cleaning, 77; picking, 112
- MADRAS. See INDIA
- Malaria Control: A Handbook of (Svensson), 151
- MALTA, 10
- Manchoukuo Cotton Industry control, 28
- Memoirs of Cotton Research Station. Trinidad. Genetics, No. 15: (a) "The Genetics of Leaf Shape in Diploid Cottons, and the Theory of Gene Interaction" (Silow). (b) "The Genetics and Taxonomic Distribution of some Lint Quality Genes in Asiatic Cottons" (Silow), 66; Genetics, No. 16: (a) "The Genetic Interpretation of Plant Breeding Problems" (Hutchinson), 130. (b) "The Inheritance of Quantitative Characters and Plant Breeding" (Panse), 131; Physiology, No. 11: (a) "Experiments in the Extraction of Sap from the Vacuole of the Leaf of the Cotton Plant, etc." (Mason and Phillis), 68. (b) "Studies of the Partition of the Mineral Elements in the Cotton Plant—I" (Phillis and Mason), 69; Physiology, No. 12: "Further Studies on Transport in the Cotton Plant—VII" (Phillis and Mason), 69
- MEXICO, 43, 155
- "The Microbiology of Silage made by the Addition of Mineral Acids to Crops rich in Protein—I. Quantitative Chemical and Bacterial Data" (Cunningham and Smith), 82
- MISSISSIPPI. See AMERICA
- Mixed Farming: Kenya, 11; Nigeria (King), 12; Tanganyika, 13
- MONTSERAT. See WEST INDIES
- MOROCCO, 102
- "Mycorrhizae: The Occurrence of, Considered Systematically with Special Reference to the Extent of our Knowledge concerning them" (Kelley), 109
- MYSOORE. See INDIA
- "Mysore-American Cotton Fruit: A Study of the Inheritance of Locular Composition in and its Relation to Yield" (Ranganatha Rao), 135
- Neps in cotton, 77, 142
- NEW MEXICO. See AMERICA
- New uses for cotton, 150, 151
- NIGERIA:
- Cotton industry, 1938-39, 12; 1939-40, 89; Half-Yearly Rpt. to September 30, 1939, 12; to March 31, 1940, 89; "Mixed Farming" (King), 12; pests, 89; "Primitive Farming of Mumuye Tribe" (Russell), 89; Samuru Exp. and Stock Farm, 153; Transport (Smith), 12; West Afr. Agr. Conference (Third), 1938; Abstracts of papers read by various authors, 153. *Northern Provinces*: cotton cultivation, 1939-40, 89. *Southern Provinces*: cotton cultivation, 1939-40, 89
- Nomograms: application (Shapiro), 143
- North African Textiles: History (Gallotti), 102
- NORTH CAROLINA. See AMERICA

NYASALAND:

Ann. Rpt. Dpt. Agr., 1938, 9, 13;
Ann. Rpt. Med. Entomologist, 1938,
9, 13; cotton industry, 1938-39, 14;
Emp. Cott. Growg. Corporation, as-
sistance rendered by, 13; soil con-
servation measures, 13

"The Oil Index in Cotton Selections"
(Tavares), 135

OKLAHOMA. See AMERICA

"One-Variety" Cotton Improvement
Associations" (Wasson), 96

"The Ontogenesis and Chemical Struc-
ture of the Vegetable (Cotton) Cell
Wall" (Hess *et al.*), 133

Parasites: African Tachinidae — II.
(Curran), 114; "Identity of Two
Important Parasites Considered as
Distinct Species" (Lal), 52. *Anaphes*
anomocerus, 48; *Apanteles balthazari*,
41, 44; *Brachymeria comitalor*, 117;
Calliephialtes dimorphus, 116; *Chelonus*
pectinophora, 43; *Empusa dysderci*, 50;
Erythmelus psallidus, n.sp., 48, 53;
Eulophus, 53; *Eurydinoteloidea*
longiventris, 41; *Goryphus* (*Melcha*)
nursei, 41, 121; *Heterospilus annulicornis*,
41; *H. gossypii*, 41; *Ichneumon*
(*Ephialtes*), 44; *Melcha nursei*, 41, 121;
Microbracon lefroyi, 41, 52, 121;
M. nigrorufum, 43; *M. pectinophora*,
43; *M. vulgaris*, 41, 44; *Orius*, 48;
Perisierola nigrifemur, 41, 44; *Polistes*,
117; *Pristomerus* sp., 43; *Rhodesina*
parasitica gen. and sp. n., 114; *Spilo-*
chalcis similima, 41, 44; *Sturmia*
hali sp.n., 114; *Telenomus* (*Phanurus*)
ullyethi, 53, 117; *Tetrastichus silvaticus*,
53; *Trichogramma*, 47; *T. evanescens*,
53; *T. lutea*, 53, 117

PERU, 29, 42, 102, 120, 127

Pests: "Aeroplanes in Campaign against
Cotton Pests" (Pinochet), 99; "Agr.
Products as Insecticides" (Roark),
40; "Cage for Insect Vectors in Plant
Inoculations" (Giddings), 44; control
measures in America, 114; "Destruc-
tive and Useful Insects" (Metcalf and
Flint), 82; "Distribution of Insects,
Spiders and Mites in the Air" (Glick),
43; "Elements of Plant Pathology"
(Melhus and Kent), 52; "Hemipterous
Insects of Cotton in Arizona" (Cassidy
and Barber), 43; "Insects and Mites
Injurious to Cotton Plant (in Egypt)"
(Willcocks and Bahgat), 41; "In-
vestigations on Fly Population of
Stable Manure Heaps in Gold Coast"
(Cotterell), 154; Rpt. of Chief of Bur.
of Ent. and Plant Quarantine, U.S.A.,
1939 (Strong), 114; toxicity of selenium-
containing plants to pests, 128.
Acrocercops helicomitra, 41. *Alabama*
argillacea. See Leafworm. *American*
bollworm. See *Heliothis obsoleta*.

Amorphis pectoralis, 42. *Anomis flava*,
92. *A. texana*, 42. *Anthonomis*
vestitus, 42. *Aphids*, 45, 114, 120.
A. gossypii, 41, 42, 45. *A. laburni*, 45.
Aphid (root), 114, 120. *Argyroproce*
leucotreta, 114, 154. *Attasextens*, 41.
Blackheaded cricket (*Gryllus domesticus*),
46, 86. *Bollweevil*, 114, 115. *Boll-*
worm, 17, 114. *Busseola fusca*, 114.
Cappara taprobanensis, 54. *Cerchysius*,
44. *Chalcodermus bondari*. See Cotton
pruner. *Chloridea obsoleta*. See
Heliothis obsoleta. *Chlorochroa sayi*,
43. *Cleisa hirta*, 41. *Corn earworm*.
See *Heliothis obsoleta*. *Cotton bollworm*.
See *H. obsoleta*. *Cotton flea hopper*
(*Psallus seriatius*), 48, 53, 114. *Cotton*
leaf hopper. See Leaf hopper. *Cotton*
Leafworm. See Leafworm. *Cotton*
mite, 42. *Cotton pruner*, 41, 48. *Cotton*
stem weevil, 7. *Cotton worm*. See
H. obsoleta. *Creontiades* (bud and boll
shedder), 41. *C. femoralis*, 43. *Cut-*
worms, 17, 41, 92. *Cycloneda sanguinea*,
120. *Diaphania hyalinata*, 44.
Diparopsis castanea. See Red boll-
worm. *Dysdercus* spp. See Stainers.
Earias, 7, 41, 52. *Edessa meditabunda*,
41. *Empoasca gossypii*, 41. *Ephialtes*
(*Calliephialtes*) *dimorphus*, 44. *Epi-*
lachna varivestis, 120. *Eriophyes*
gossypii, 41. *Eublemma amabilis*, 52.
Euschistus impictiventris, 43. *Eutro-*
pidacris cristata, 49. *Field cricket*
(*Gryllus assimilis*), 49. *Forest tent*
caterpillar, 53. *Frankliniella tritici*.
See Thrips. *Gargaphia torresi*, 41.
Gasterocercodes brasiliensis, 41. *Gorgojo*
paraguayi, 99. *Gryllulus* (*Gryllus*)
assimilis. See Field cricket. *Heliothis*
armigera. See *Heliothis obsoleta*.
Heliothis obsoleta (variously designated
American bollworm, cotton bollworm,
cotton worm, corn earworm): in
America, 46, 47, 119, 120; California,
53; Fiji, 114; Queensland, 17, 92;
Southern Rhodesia, 42, 53, 114;
Russia, 47, 53; South Africa, 47;
"Investigations on" (Parsons): Pt. I,
46; II, 117; III, 118; Swaziland, 42.
Heliothis virescens, 42. *Helopeltis*, 16,
89, 120. *Hippodamia convergens*, 120.
Hodotermes. See Termites. *Holocera*
pulverea, 52. *Horcius nobilellus*, 49.
Hypomeces equamosus, 42. *Jassid*, 7,
17, 42, 86, 91, 92, 114, 154. *Laccifer*
lacca, 52. *Leaf hopper*, 42, 114.
Leafworm, 18, 19, 20, 41, 114, 117.
Leptoglossus membranaceus, 54. *Locusts*,
50, 122. *Lygus*, 91, 154. *L. elisus*, 43.
L. hesperus, 43. *L. lucorum*, 50.
L. pratensis oblineatus, 43. *Macro-*
siphum (*Acyrtosiphon*) *gossypii*, 45.
Mescinia peruella, 42. *Mole cricket*
(*Gryllotalpa* L.), 41. *Nezara*, 41.
Oryzarenius hyalinipennis, 41. *Phena-*
coccus gossypii, 41. *Pink bollworm* :

- disinfection of cotton seed against, 128; in America, 43, 45; Belgian Congo, 44; Brazil, 41, 44, 116; Burma, 41; Egypt, 41; India, 7, 52, 86; Iran, 44, 115; Java, 42; Mexico, 43; Queensland, 92; Sudan, 91; Tanganyika, 114; Uganda, 154; W. Indies, 18, 19, 20; "Investigations on" (Squire), 45, 115. *Pinnaspis minor*, 41. *Predaceous wasps*, 44. *Psallus seriatus*. See Cotton flea hopper. *Pseudococcus brevipes*, 41. *Rats*, 91. *Red bollworm* (*Diparopsis castanea*), 13, 114. *Red spider*, 41, 50, 121, 128. *Rhynchocha serratus*, 54. *Rough bollworm* (*Earias huegeli*), 92. *Rutherglen bug*, 17. *Saissetia depressa*, 41. *Schistocerca australis*, 41. *Spider mite*. See Red spider. *Spiny bollworm*, 41, 42, 82, 121. *Spotted bollworm*. See Spiny bollworm. *Stainers*: America, 43, 82; Belgian Congo, 26; Burma, 41; Southern Rhodesia, 42; Tanganyika, 114; Uganda, 154; West Indies (Squire), 50. *Stem weevil*, 86. *Stethorus punctillum*, 121. *Sudan bollworm*. See Red bollworm. *Sylepta derogata*, 53. *Tarsonemus latus*, 41, 51. *Termites*, 51, 121. *Tetranychus telarius*. See Red spider. *Thrips*, 52. *Thyania custator*, 43. *White fly*, 122. *Wireworms*, 92. *Yellow peach moth*, 17, 92
- Picking machinery, 112
- Pima and S×P cottons: revised grade standards, 94
- Pima cotton yarns: spinning, 77
- Plants with new characters: the production of, by doubling the number of chromosomes (Kostoff), 62
- "Plant Breeding Problems: India" (Ramiah), 130; "Plant Breeding: Recent Progress in" (Babcock), 129; "Plant Breeding: Use of Colchicine in," 136
- "Polyploids in *Gossypium*: The Production of" (Beasley), 137
- PORTUGAL, 102
- Prices, 94, 99, 148, 149; futures, 149; spot, 149
- Progress Rpts. from Experiment Stations, 1938-39, 9; Review of the Work (Nowell and Munro), 10
- PUERTO RICO, 42
- PUNJAB. See INDIA
- QUEENSLAND, 9, 17, 92
- Raw cotton: outlook, 148; price control, 148; "Raw Cotton: Staple Length" (Roehrich), 142
- The Rectifier, 78
- "Relationship of Certain Physical Fibre Properties in Improved Cotton Varieties to Spinning Quality" (Moore), 71; "Relationship of *Gossypium raimondii* Ulb." (Hutchinson), 65
- RHODESIA (NORTHERN), 89
- RHODESIA (SOUTHERN), 42, 53, 90, 114
- Ridger grader, 34
- "Root-Forming Substances used for Propagation Purposes" (Tincker and Unwin), 82
- Rotation experiments, 92, 96
- Rothamsted Experimental Station: Rpt. for 1938, 30
- RUSSIA:
- Cotton growing in, 30, 102, 103; "Detrimental Trends in Russian Genetics and Plant Breeding" (Lewicki), 62; diseases, 59; "Genetic Front in U.S.S.R." (Pincus), 132; "Hybridization Experiments" (Vavilov), 64; "Lysenko, Dr. T. D.: Apply Theory and Work of to Flax and Cotton" (Poperekov), 62; parasites, 47, 53; pests, 45, 47, 50, 53, 121
- Rust-red cotton: Examination (Haller), 78
- "Samples with possibly Unequal Variance: Comparison of" (Fisher), 110
- "Sand Culture of Cotton Plants" (Olcott), 38
- "Science and Empire Cotton Production" (Fielding), 15
- Seed: "Changes in *Gossypol* during Ripening and Storage of Cotton Seed" (Podolskain), 146; "Cotton Seed Tests: Permeability" (Brown), 146; "Crushing Cotton Seed Co-operatively" (Burgess), 113; "Delinting and Germination of as affected by $ZnCl_2$ 2HCl Treatment" (Singh and Kapoor), 37; "Disinfection of" (Haskell and Barker), 128; "Disinfection" (Russo), 128; "Effect of Type and Period of Storage on Cotton Seed after Treatment with Organic Mercury Dusts" (Miles), 111; increased yields of cotton treated with ceresan, 109; "The Presence of Resin in the Kernel of Cotton Seeds" (Tobler), 111; "Technical Applications: Chronology" (Bass and Olcott), 113; "Treatment, of to Control Diseases" (Starr Chester), 128; "Variations in the Composition and Grade of produced in Various Cotton States, 1934-35 to 1937-38" (Meloy), 96; "Viability of as affected by Moisture Content" (Christidis), 110; "Viability of as affected by Moisture and Age under Different Methods of Storing" (Flores), 62
- Seed cotton: Drying, 38, 39
- Selenium in soils and crops, 109; "Selenium Absorption by Plants: Relation of Sulphate to" (Hurd-Karrer), 35; selenium-containing plants: toxicity of to pests, 128
- Shirley Institute. See Br. Cott. Indus. Res. Assn.
- SIAM. See THAILAND
- SICILY, 123, 141
- SIERRA LEONE, 154
- Simon's Heater, 19
- SIND. See INDIA

Skinner's Cotton Trade Directory of the World, 1939-40, 81

Soils: "A Critical Survey of Investigations on the 'Wilting' Coefficient" (Botelho da Costa), 31; "Cultivation of Cotton on Complex Solonetz Soils" (Taranovskaia and Gorienskii), 104; "Effect of Calcium Arsenate upon the Yield of Cotton on Different Soil Types" (Dorman and Coleman), 108; "Effect of Organic Matter on the Water-Holding Capacity and the Wilting Point of Mineral Soils" (Bouyoucos), 104; "The Formation of Structure in" (Sideri), 31; "An Introduction to the Scientific Study of" (Comber), 30; "A Mechanical Device for Determining the Permanent Wilting Point of by means of the Cohesion Method" (Bouyoucos), 31; "The Minor Elements of the Soil" (Jacks and Scherbatoff), 103; "Perennial Grasses and Soil Structure" (Bradfield), 104; "Rpt. on Journey to W. Indies and U.S.A. for Study of Soils" (Milne), 155; "Soil and Irrigation: Water Conditions of" (Menchikowsky), 31; "Soil Organic Matter and the Living Plant" (Blair and Waksman), 31; "Soil Science: An Introduction to" (Isgur), 103; "Soil Survey: Some Aspects of Modern Practice in" (Milne), 105

"Soil Conservation" (Bennett), 105; "The Research Side" (Milne), 105; "Roads and their Relationship to (in Kenya)" (Maher), 105; "A Visit to the U.S.A. to Study" (Maher), 155; "Soil Conservation r. Insect Control" (Harris), 32; soil conservation measures in Nyasaland, 13; in Uganda, 16; "Soil Conservation in the Tropics" (Stockdale), 31; "Soil and Water Conservation" (Aylen), 32, 105

Soil erosion: "Control" (Burgess), 33; "Control in Central India and Rajputana" (Wad), 33; "A Note on the Prevention of Extension in Ravine Lands, and Improvement of Fodder and Grazing in Waste Ravine Lands" (Shah), 33; "The Rôle of Strip Cropping in Erosion Control in the Black Lands of Texas" (Deeter), 33; "The Use of Level Contour Banks, etc., in Native Areas" (Maher), 33; "Soil Erosion and Soil and Water Conservation: Bibliography of" (Gaines *et al.*), 32

Soils and fertilizers (Jacks), 106

Soil maps: a comprehensive legend for (Storie), 32

SOUTH AFRICA:

Ann. Rpt. Dpt. Agr. and For., 1938-39, 9, 14; Barberton Exp. Station, 14, 15; "Cotton Culture" (du Toit), 14; cotton cultivation, 1938-39, 14; cotton prospects, 1939-40, 14; Emp. Cott.

Growg. Corp., assistance rendered by, 14, 15; "Encouragement of Beneficial Insects in" (Ullyett), 42; "Experimental Methods with Cotton"—II (MacDonald *et al.*), 63; parasites, 117; pests, 51, 122; "Investigations on *Heliothis obsoleta*" (Parsons)—I, 46; II, 117; III, 118

"South and East African Year Book and Guide, 1940," 15

SOUTH CAROLINA. See AMERICA

"S×P Cotton in Comparison with Pima" (Kearney *et al.*), 134

Spinning problems: Discussion (Southern Text. Assn.), 143; "Spinning (Cotton), Recent Tendencies in" (C.B.), 143; "Spinning and Doubling of Coarse Cotton Yarns" (Draper), 77; spinning of Pima cotton yarns, 77; "Spinning Quality of Cotton" (Moore), 71; "Spinning Quality of Indian Cotton: The Effect of Fibre Weight per inch on" (Ahmad), 73; "Spinning Room Humidity" (Kempaner), 78; "Spinning Tests on Indian Cottons" (Ahmad), 5, 86

"Staple Fibre-Cotton and Cotton-Cottonized Hemp Mixture Fabric: Resistance to Washing" (Mutti), 147

"Statistical Analysis: Methods of" (Goulden), 109; "Statistical Analysis (Modern) for Field Experiments: The Analysis of Variance for Simple Factorial Experiments" (Borden), 36; "Statistical Methods, with Special Reference to Field Experiments" (Saunders), 110

Statistics: "Cotton Statistics" (Todd), 79, 149; Empire cotton crops, 1929-39, 84; "Statistics of Cotton and Related Data" (Cooper), 80

ST. KITTS - NEVIS - ANGUILLA. See WEST INDIES

"Striding Level for Laying out Contour Banks" (Savile), 34; "Striding Level and Frame" (Wade and Cowley), 33

Stroboscope for the textile industry, 143

ST. VINCENT. See WEST INDIES

SUDAN:

Admin. and Finan. Rpt. for 1938, 9; Ann. Rpt. Dpt. Econ. and Trade, 1938, 9, 15; cotton industry, 1937-38, 15, 91; diseases in, 91; ginneries, 91; parasites in, 117; pests, 117; varieties of cotton, 15

SWAZILAND, 15, 42, 117

TANGANYIKA:

Ann. Rpt., Dpt. Agr., 1938, 9, 15; cotton industry, 1938, 16; cotton prospects, 1939-40, 91; diseases, 114; "Mixed Farming" (King), 12; pests, 91, 114

"Technical Training and the Cotton Industry: The Future of" (Read), 137

Technological Reports on Indian Cotton, 1939-40 (Ahmad), 6, 86; Technological Research Laboratory, Bombay, 85, 86

TEXAS. See AMERICA

"Textiles: Regain of and Humid Atmosphere Changes" (Cassie), 76; "Textile Fibres and Fabrics: The Effect of Climatic Exposure on" (Thayssen *et al.*), 74; "Textile Technology: Research Problems" (Schwarz), 143

THAILAND (SIAM), 30, 103

TRINIDAD. See WEST INDIES

TURKEY, 103

UGANDA:

"Bukalasa Experiment Station: Some Results from" (Nye), 91; cotton industry, 1937-38 and 1938-39, 16; cotton prospects, 1939-40, 16; 1940-41, 91; cotton reports, 1938-39, 154; diseases in, 58, 59, 154; pests, 16, 91, 154; soil conservation measures, 16; varieties of cotton in, 16, 154

UNITED PROVINCES. See INDIA

URUGUAY, 103

"Variability of Plant Density and the Estimation of Yield of Cotton by Sampling" (Kalankar and Dhannalal), 67; "Variability of Plots of Various Shapes as affected by Plot Orientation" (Christidis), 37

Varieties of cotton: *Acala*: America, 72, 98, 133, 134; California, 93; Peru, 127. 1027 ALF, 87. A.R. Busoga, A.R. Jinja, A.R. Kampala, 5. *Arkansas Acala*, 96. *Arkansas Rowden*, 96. *Bahim Abiad*, 25. *Bailhongal*, 86. *Bani*, 74. *Batangas*, 62. *Berar*, 86. *Biancavilla*, 141. *Bijapur*, 5. *Bleak Hall*, 137. *Blue Benders*, 78. *Bokda*, 8. *Boss III-16*, 88. *Bourbon*, 19. *B.P. strains*, 154. *Broach*, 8, 86. *Broach Palej*, 74. *Buganda Local*, 58. 145 C.55, 27. *Cambodia*: Ceylon, 10; India, 7, 9, 87; Thailand, 30. *Chicken Foot*, 67. *Clewevilt* 6, 59. *Co.2*, 87. *Coker strains*, 72, 97. *Coker-Wilds*, 127. *Cook*, 59. *Cooke* 307-8, 59. *C.P. No. 1*, 86. *Cwn 520*, 74. *Delfos*, 97, 127, 134. *Deltapine*, 97, 98, 111. *Dixie strains*, 127. *Dixie Triumph*, 59, 97. *Doddahatti*, 8. *D. and P.L. 77A*, 97, 111, 134. *Erbacao Paraisano*, 100. *Express*, 101. 289 F/K25, 5. *Farm Relief*, 72. *Farm Westerns*, 5. *Ferguson No. 406*, 30. *Gaorani*, 7. *Giza*: Egypt, 24, 25, 99; Peru, 127. *Gossypium species*, 136, 137. *Gossypium raimondii*, 135. *H.1*, 7, 87. *H.105*, 101. *H.190*, 8. *Hagari*, 6, 7. *Half-and-Half*, 98, 137. *Hopi*, 59, 140. *Hyderabad Bani*, 7. *Ilvcos Brown*, 62. *Improved Bancroft*, 14. *Ishan*, 12, 89. *Jagadia*, 86. *Jayawant*,

5, 6, 7. *K.1*, 87. *Kadi-Viramgan*, 5. *Kekchi*, 59. *Khandesh*, 86. *Koilpatti*, 7. 7L.1 and 7L.5, 90. *Latur*, 86. *Late Verum (Nagpur)*, 86. *Lecrem*, 15. *Lightning Express*, 98, 137. *Lone Star*, 92, 134. *L.S.S.*, 8, 86. *M.A.17*, 8. *Malvi*, 74. *Marie Galante*, 17, 19. *Mars Rose*, 127. *Mebane*, 98. *Meso-white*, 11. *Mexican 87-8 and 128*, 72. *Mexican Big Boll*, 65; America, 138, 140; California, 59. *Miller*: Peru, 127; Queensland, 17, 92. *Miraj*, 86. *Missdel*, 59. *Missdel No. 4A*, 30. *Mollisoni*: India, 6, 74, 81. *N. 3-2/14*, 87. *N.14*: India, 7, 87; Trinidad, 69. *Nandyal*, 6. *Navsari*, 86. *New Boykin*, 30, 92. *Oklahoma Triumph*, 92. *P.A.4F.*, 86. *P.A.289F.*, 86. *Perso-American*, 9. *Philippines wild cotton*, 62. *Pima*: in America, 94, 134, 137; Morocco, 102; Peru, 29, 127. *Pima Egyptian*, 62. *Punjab-American*: India, 6, 8, 74, 81. *Rinon*, 127. *Rogers Acala III*, 133. *Rowden*: America, 72, 98, 134. *Rust-red*, 78. *Sakellaridis*, 127. *Salems*, 7. *Sanguineum 119*, 8. *Sannahatti*, 8. *Santa Lola*, 134. *Sar-Sar*, 102. *Sea Island*: America, 59, 137, 140; India, 127; Philippines, 62; West Indies, 17, 69. *Sea Island V.135*, 69. *Semiaspero*, 127. *S.G.29*, 10. *Shaokan Long Staple*, 67. *Sind NR (27 WN)*, 88. *Sind Sudhar*, 86, 88. *S.P. strains*, 16, 154. *S x P*: America, 94, 134; Peru, 127. *Station Miller*, 97. *Stoneville strains*: America, 96, 97, 98, 134; California, 59. *Super Seven*, 139. *Surat*, 86. *Sykes W.R.*, 59. *Tanguis*: Peru, 29, 30, 137. *Texacala*, 133. *Texas*, 101. *Tiruppur Cambodia*, 86. *Toole (Perry)*, 59. *Tuxtla*, 59. *U4*: Ceylon, 10; South Africa, 14; Swaziland, 15; Uganda, 16. *UA83*, 126. *Ujjain*, 86. *Umri Bani*, 86. *V.185*, 69. *Verum* 262, 86. *Verum 262 (Akola)*, 86. *Wagale*, 41, 88. *Wagyi*, 41, 88. *Wannamaker Wilt-Resistant Cleveland*, 97. *Westerns*, 5, 86. *Wilds*, 97. *Wuchang White Seed*, 67. *X1530 A* and *X1730 A*, 15

"Varieties of Cotton (Improved): Registration of" (Brown), 133; "Varieties of Cotton (Improved): The Relation of Certain Physical Fibre Properties in to Spinning Quality" (Moore), 71

West African Agr. Conference (Third), Nigeria, 1938: abstracts of papers discussed, 152

WEST INDIES:

Cotton industry, 1938-39, 17; pests, 18, 19, 20, 45, 115. *Antigua*, 9, 18. *Barbados*: Agr. Jour., Dpt. Sci. and Agr., VIII, Pts. I and II, 1939, 9, 19; "Cotton Growing and Cotton Pests Control" (Tucker), 19; cotton industry,

- 1938-39, 19; 1939-40, 92; "Manurial Trial with Sea Island Cotton" (Saint), 19. *Grenada*, 9, 19. *Montserrat*, 9, 19. *St. Kitts-Nevis-Anguilla*, 9, 20. *St. Vincent*: Ann. Rpt. Dpt. Agr., 1938, 9; "Investigations on Pink Bollworm" (Squire), 45, 115. *Trinidad*, 18
- "West Indian Plant Quarantine Station: Work of, from 1934-39" (Adamson and Baker), 18
- West Indian Sea Island Cotton Assn., 4th Ord. General Meeting, 1939, 18
- "What Happens to the Rain?" (Keen), 32
- "World Cotton Crop: Prospects, 1939-40" (Salto), 79; world cotton output in 1938-39, 79; world cotton situation, 79, 147; world production and consumption of cotton, 148
- "Zyklon B" disinfectant, 19

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